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(12)(19)(CA) **Demande-Application**

(21)(A1) **2,300,202**
(86) 1998/08/19
(87) 1999/02/25

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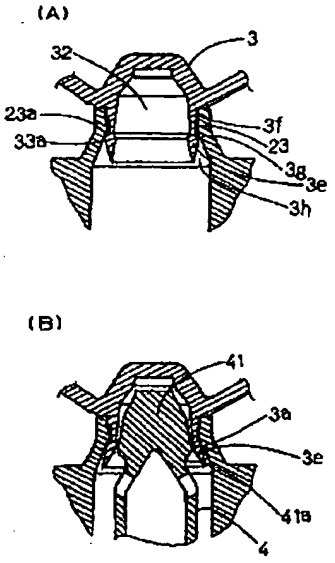
(51) Int.Cl.[7] G03G 15/08, G03G 15/10
(30) 1997/08/19 (9-238866) JP
(30) 1997/11/11 (9-327070) JP

(54) **CARTOUCHE DE TONER ET MECANISME SERVANT A OUVRIR ET A FERMER L'ORIFICE DE COMMUNICATION DE CETTE CARTOUCHE**

(54) **TONER CARTRIDGE AND MECHANISM FOR OPENING AND CLOSING COMMUNICATION PORT OF THE SAME**



(57) Cartouche de toner capable d'ouvrir et de fermer son orifice de décharge de toner, en toute sécurité et sans difficultés, même dans le cas d'une diminution de quantité provoquée par la consommation du toner par un dispositif, tel qu'une photocopieuse et compensée par ladite cartouche de toner, de manière à empêcher la détérioration de la qualité du toner contenu dans un

(57) A toner cartridge capable of opening and closing a toner discharge port thereof reliably and easily even when only a decrease in quantity caused by the consumption of the toner in an apparatus such as a copier is replenished from the toner cartridge thereto in order, and preventing the deterioration of the toner quality in a toner container for a long period of time, wherein the

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réservoir pendant une durée prolongée, l'intérieur du réservoir (204) étant rempli de toner par injection de ce dernier à l'intérieur dudit réservoir depuis une partie de décharge (201) solidaire dudit réservoir; un mécanisme sert à ouvrir et à fermer l'orifice de communication de la cartouche, un disque de clapet (206) de la partie décharge (201) de toner possédant une partie verrouillage principale (209) conçue pour être placée dans un orifice de décharge (208) afin de fermer ce dernier, et une partie d'accouplement (213) conçue pour être accouplée à une partie (211) servant à actionner le disque de clapet et appartenant au dispositif, tel qu'une photocopieuse. Quand on abaisse cette partie (211), afin de provoquer le déplacement simultané de la partie d'accouplement (213), ceci provoque l'accouplement réciproque de la partie verrouillage principale (209) et de l'orifice de décharge (208), de manière à fermer hermétiquement ledit orifice de décharge.

interior of a toner container (204) is filled with toner by injecting the toner thereinto from a discharge section (201) thereof; and a mechanism for opening and closing the communication port of the cartridge, wherein a valve disc (206) in the toner discharge section (201) has a main locking section (209) adapted to be fitted in a discharge port (208) to thereby close the same, and a joint section (213) adapted to be joined to a valve disc operating section (211) of the apparatus such as a copier. When this section (211) is moved down to cause the joint section (213) to be moved therewith in a state connected thereto, whereby the main locking portion (209) and discharge port (208) are engaged with each other, so that the discharge port is reliably closed.

ABSTRACT

A toner cartridge is provided which may surely and easily open and close a toner outlet when only the amount of toner corresponding to the amount used up in the device such as copying machines is supplied from the toner cartridge in sequence as needed, and which may preserve the toner without deterioration for a long period of time. By introducing toner through a toner discharge member 201 of the toner container 204, the toner container 204 is filled with the toner. A valve body 206 of the toner discharge member 201 includes a main fitting portion 209 of closing the outlet 208 by fitting in the outlet 208, and a connecting portion 213 adapted to be connected with a valve body operating member 211 of the device such as copiers. If the valve body operating member 211 of the device descends, the connecting portion 213 moves together with the valve body operating member 211 by contact with the latter to achieve a fitting connection between the main fitting portion and the outlet 208, thereby to ensure a closing to the outlet.

SPECIFICATION

TITLE OF INVENTION

TONER CARTRIDGE AND OPENING AND CLOSING MECHANISM FOR PASS-THROUGH OF SAME

Technical Field

The present invention relates to a toner cartridge for supplying powder or liquid toner (including printing ink) to the developing device such as a copying machine, printer, or printing machine, and the opening and closing mechanism for pass-through of same.

Background Art

Powder or liquid toner as an electrophotographic developer for use in the copying machine, printer, or printing machine is generally contained in a toner cartridge for further supply of same to the device such as the copier. The toner is transferred from the toner cartridge into the toner reservoir of the copier. A structure has been used for this purpose such that a seal is affixed to the toner outlet, and the seal is removed when the toner is supplied. However, with said structure, once the seal has been peeled off, the outlet can not be closed again.

Toner cartridges have been proposed wherein the toner outlet is provided with a valve body which is biased by a spring in a direction of its blocking passage (Japanese Patent Applications laid open Nos.60-80878, 7-44005, and 8-137229). With these devices, however, it is necessary to mount a spring in the toner container. This renders the structure complex, and if the toner cartridge is subjected to a great vibration during transportation, there is a risk of the spring coming loose to such an extent that a trace of toner may leak out.

Said Japanese Patent Application laid open No.7-44005 disclosed a toner cartridge wherein the toner outlet is put in a closed position by fitting a valve body in the outlet prior to use of toner, and the toner outlet is opened by pushing up the valve body to open it when the toner is used. However, once the outlet has been opened, the fitting position can not be retraced. Therefore, the outlet can not be closed completely during the operation. In this connection, in case the form is taken of supplying toner from the toner cartridge in sequence dependent on the amount of toners consumed, there may incur a risk of toner leaking little

by little from the outlet with no valve fitted therein. The Japanese Patent Application laid open No.7-44005 proposed an arrangement such that the closed position of the outlet by the valve may be retained by magnetic force. The necessity of mounting an additional member such as a magnet will unavoidably involve extra production cost.

In the past have been used toner containers chiefly made of hard synthetic resins which may remain unchanged in volume irrespective of the consumption of toners. However, in case toners are supplied in sequence from the toner cartridge in accordance with the toner consumption, a certain amount of toner may be left over within the toner container for a long period of time. In that case, the toner is apt to deteriorate because the toner remains exposed to the air inside the toner container for a long time.

Disclosure of Invention

In this view, the present invention provides for its object a toner cartridge which may surely and easily open and close the toner pass-through.

Another object of the present invention is to provide a toner cartridge which may prevent deterioration of toner in the toner container for a long period of time even if the form is taken of supplying toners in sequence from the toner cartridge according to the amount of toners used up.

Further object of the present invention is to provide a toner cartridge which may surely and easily open and close the pass－through, and in particular, is suitable for a supply system in which each toner loss may only be compensated for by replenishment of fresh toners.

Further object of the present invention is to provide an opening and closing mechanism of the pass－through in the toner cartridge, which is of a relatively simple structure but may readily open and close the pass－through, and securely maintain the closed position once the pass－through has been closed.

In order to solve the above-mentioned technical tasks, the present invention provides the following means.

A first invention of the present application provides a toner cartridge comprising a toner container containing of powder or liquid toners for use in developing device, and a connecting member for supplying the toners from said toner container to the developing device, characterized in that the connecting

member includes a pass-through and a valve body for opening the pass-through provided in the connecting member when a valve body operating member of the developing device is at work, and closing the pass-through when the valve body operating member is at rest, and that the toners may be discharged from the opened pass-through.

The connecting member so called here functions as a toner discharging member and its pass-through serves as a toner outlet when the toners are discharged from the toner cartridge, while the connecting member functions as a toner filling member and its pass-through serves as a toner fill opening when the toner cartridge is filled with the toners (this applies to the following inventions).

A second invention of the present application provides the toner cartridge in accordance with the first invention, characterized in that the toner container is provided with a shrinkable portion of shrinking according to the loss of toners in the toner container.

In the first and second inventions of the present application, when a toner supply is needed in the developing device such as copiers, the valve body operating member of the developing device is operative to open the outlet to supply toner. As soon as the supply of a desired quantity of toner is finished, the valve body operating member of the developing device is put in a non-operative position, and the pass－through is closed by the valve body, thereby to head off any possible leakage of toner from the pass－through. The valve body operating member may be arranged such that it may actuate the valve, moving to or away from the valve body, or it is put in the operating or nonoperating position by the cartridge moving to or away from the valve body operating member while the valve body operating member itself is stationary in a location. The actuation of the valve by the valve body operating member may be automatically achieved, and the switchover of the operating position to the nonoperating position and vice versa may be manually carried out.

With the second invention of the present application, since the toner container is provided with a shrinkable portion of shrinking according to the toner loss, the internal volume of the toner container is decreased as the toner is discharged. This may place a check on entry of air into the toner container, and thus, even if the toner supply is kept suspended for a long time, any

deterioration of toners in the toner container can be prevented.

A third invention of the present application provides a toner cartridge in accordance with the second invention, characterized in that the toner container may be filled with toner by pouring toner through the connecting member when the shrinkable portion of the toner container is in the shrink position, and that the valve body has a main fitting portion of closing the pass-through by fitting into the pass－through, and a connecting portion of connecting with the valve body operating member so that when the valve body operating member of the developing device relatively proceeds to an undischarged position, the connecting portion displaces together with the valve body operating member while the former is held in connection with the valve body operating member, whereby the main fitting portion is fitted with the pass－through.

In the third invention of the present application, since the toner container is filled with toner by injecting toners through the outlet when the shrinkable portion of the toner container is in the shrink position, toners can be put into the toner container which does not almost contain air. Referring to a bag made of resilient synthetic resin and called pouch, it may be filled with some content by injecting the latter through a location other than the outlet before it is sealed by hot welding. Specifically, filled contents are probably involved in hot welded zones. For example, if the filled contents are liquid or fine particles and its quantity is thick on the ground, said contents may reach the welded zones. In particular, in case of the fine particles, floating powders may be involved in the welded zones. Then, a sufficient welding can not be performed. Particularly, in case the toner is of a liquid type, if hot welding is carried out with the liquid involved, the liquid expands according to the change of temperature so that there is a high possibility of a sufficient hot welding being unobtainable. This necessitates the provision of a sizable gap between the filled contents and the hot welded zone of a synthetic resin pouch. As a result of it, a space necessary for the performance of thermal welding must be provided, which makes it difficult to completely fill the entire container with the content, thereby resulting in a sealing with air-packed space. Contrary to this, this invention can almost fully fill the container with toners because the toner container may be filled with toners in a condition where little air occurs in the container. Therefore, a long-term preservation of toner could never cause any change of

properties to the toner. Moreover, since the filling takes place when the air rarely remains within the container thanks to the complete shrinkage of the shrinkable portion of the toner container, it is unnecessary to eliminate air from or introduce air into the container at the filling time. This enables speedup of the filling operation.

Additionally, in the third invention of the present application, the valve body has a main fitting section of closing the pass－through by fitting with the pass－through, and a connecting portion of connecting with the valve body operating member so that when the valve body operating member of the developing device relatively proceeds to an undischarged position, the connecting portion displaces together with a valve body operating member while the former is held in connection with the valve body operating member, whereby the main fitting member is fitted into the pass－through. Consequently, the pass－through is strongly sealed by the fitting between the main fitting member of the valve body and the pass－through (in particular, by a forced fitting operation which is performed by deforming the constituent materials of at least one of the both members to be fitted to each other). Said forced fitting operation may be completed not by a spring but by moving the valve body by means of the connection of the connecting portion of the valve body and the valve body operating member.

Thus, the connection of the connecting portion and the valve body operating member may preferably provide a connection of the valve body and the valve body operating member which may be performed by fitting of the main fitting portion into the pass-through, especially, with a strength which can constitute a forced fitting. The examples of specific means to achieve such a purpose are the forced fitting of the connecting portion and the valve body operating member, the provision of a receiving hole on one of the members and a projection on the other one, or the connection of the both members by screws and magnetic force.

In the first, second and third inventions of the present application, a direct connection of the pass－through and the storing section such as the toner reservoir at the developing device's side through a peripherally closed discharge pathway in the form of a cylinder is advantageous in that toners can be prevented from scattering in the device and that toners can be introduced into the storing section such as the toner reservoir at the developing device's side to

the exclusion of the air from outside. As an example of concrete means for achieving the purpose may be illustrated a valve body operating member at the developing device's side which is in the shape of a hollow cylinder so as to also serve as a discharge pathway so that when the valve body is in an open position, the hollow cylindrical valve body operating member may communicate with the toner container. Alternatively, if the valve body operating member does not function as a discharge pathway, the peripherally closed discharge pathway such as a cylinder may be put to or fitted into the pass-through.

The fourth invention of the present application provides a toner cartridge as defined in the described inventions characterized in that the toner container includes a second connecting member other than said connecting member, and that the second connecting member may selectively conduct circulation of fresh air so as to adjust the pressure inside the toner container.

When the toner container is filled with toners or toner are discharged from the container, the fourth invention makes it possible to make adjustment of the air within the container to ensure that a smooth filling or discharging of toners will take place.

A fifth invention of the present application provides a toner cartridge as defined in the described inventions characterized in that the toner container receives toners injected from the connecting member until the toner container is filled with the toners, and then, the discharge of the air within the toner container may be executed by an air discharge means of discharging the air from the container without allowing an outflow of the toner.

In this fifth invention, the discharge of the air within the container can be also made after toners have filled the container in, whereby adjustment of the pressure within the container and prevention of deterioration of the toners can be effectively achieved.

A sixth invention of the present application provides an opening and closing mechanism for the pass-through of the toner cartridge, characterized in that a connecting member of the toner cartridge for supplying powder or liquid toner for developing device from the toner cartridge comprises a main body provided with a pass-through, a valve body for opening and closing the pass-through, moving to or away from the pass-through, a fixing means for fixing the valve body to ensure that the valve body holds the outlet in the closed position, and a

valve body operating member for moving the valve body between the opened and closed positions by contact with the valve body.

With the sixth invention of the present application, when the supply of toner is needed in the developing device such as copiers, the connecting member is opened by the action of the valve body operating member for supply of toner. If a desired supply of toner is finished, the valve body operating member is put in a nonoperating position so that the connecting member is closed by the valve body, thereby preventing any leakage of toner from the connecting member. The valve body operating member may be arranged such that it may actuate the valve, moving to or away from the valve body, or it is put in the operating or nonoperating position by the cartridge moving to or away from the valve body operating member while the valve body operating member itself is stationary in a location. The actuation of the valve by the valve body operating member may be automatically achieved, and the switchover of the operating position to the nonoperating position and vice versa may be manually carried out. The valve body operating member may be separate from or integral with the valve body. The toner container may be provided with the shrinkable portion of shrinking according to the loss of toners within the toner container, but it may be of a deformable type which is made from hard resin. However, a toner container with the shrinkable portion decreases its internal volume as toners are discharged. This may advantageously avoid any entry of air into the toner container, and prevent any deterioration of the toner even if the supply of toner remains suspended for a long period of time.

A seventh invention of the present application provides an opening and closing mechanism for the pass-through of the toner cartridge characterized in that the connecting member of the toner cartridge for supplying powder or liquid toners for developing device from the toner cartridge comprises a body including a pass-through, a valve body for opening and closing the pass-through by moving to or away from the pass-through, a retaining means for retaining the valve body in a position to render the pass-through closed, and a valve actuating member formed integral with the valve body for moving the valve body between opened and closed positions, said valve actuating member being provided to stretch over the areas in and about the pass-through, and that the valve body operating member arranged outside the pass-through puts the valve

actuating member in motion so as to move the valve body between opened and closed position.

With the seventh invention, the valve body and the valve actuating member for actuating the valve body are formed integral with each other, and the valve body operating member is designed to operate the valve actuating member.

A eighth invention of the present application provides the opening and closing mechanism for the pass-through of the toner cartridge as defined in any of the sixth and seventh inventions, characterized in that the valve body operating member is provided in the developing device, the valve body operating member acts to put the valve body in an opened position only when the developing device is in need of supply of toners, and the valve body operating member acts to put the valve body in a closed position when the supply of toners comes to end.

The eighth invention makes it possible to completely prevent the air from flowing into the toner container by means of an arrangement such that the valve body is opened only when the developing device needs the supply of toners, and closed when the supply of toners is over.

A ninth invention of the present application provides the opening and closing mechanism for pass-through as defined in said sixth to eighth inventions, characterized in that a working member for moving the connecting member and the valve body operating member relatively to and/or away from each other is provided in the developing device by displacing at least one of the connecting member and the valve body operating member for manual or automatic control of said working member.

The working member of the ninth invention causes more simple coupling and non-coupling of the connecting member of the toner cartridge and the valve body operating member at the side of developing device.

The toner cartridge in accordance with the respective inventions of the present application implies a cartridge for supplying powder or liquid toner (including printing ink) to various kinds of developing/printing devices such as the copier, printer (laser printer, inkjet printer), and printing machines (hereinafter referred to as the developing device) The developing/printing devices include a system in which a reservoir is provided of storing toners which have been supplied from the cartridge, and a system in which there is not provided a reservoir, but the toner cartridge functions as a toner reservoir

instead, too. The present invention is applicable to any system.

The first and second inventions of the present application provide a toner cartridge wherein the outlet can be surely and readily opened and closed, and in particular, as the quantity of toner corresponding to that of toners used up in the developing device may only be supplied from the toner cartridge in sequence, and additionally, the toner discharge pathway may be used as a toner filling pathway, whereby the toner filling operation can be surely and easily carried out. Moreover, toners may be supplied to the storing section such as a toner reservoir of the copier etc., by establishing a direct connection of the latter with the outlet, thereby preventing the toner from scattering within the system as well as the entry of air into the system when the toner filling takes place so that toners maintaining its high quality may be supplied.

In accordance with the second invention of the present application, in addition to the above-described effect, since the shrinkable portion of the toner container is adapted to shrink according to the loss of toner, no space will be formed in any place of the toner container, thereby affording protection of toners against contact with air so that any deterioration of toners within the toner container can be arrested for a long period of time.

With the third invention of the present application, in addition to the effects of the first and second inventions, the valve body can be surely fitted to the outlet only by a simple motion of the valve body operating member of the developing device rather than biased by a spring to ensure that the outlet will be made airtight by a simple structure and operation. Additionally, the toner container can be almost completely filled with toners by pouring the toners through the discharge member with the shrink member of the toner container kept in the shrink position, so that the toner may be preserved without any quality change for a long time and the filling operation can be conducted with higher speed.

In the fourth and fifth inventions, adjustment of pressures inside the toner cartridge can be made, and deterioration of toners can be avoided by discharging the air from the container.

The sixth invention of the present application provided the opening and closing mechanism for the connecting member of the toner cartridge wherein the connecting member can be easily opened and closed by a relatively simple

structure, and once the connecting member has been closed, such a closed condition can be securely maintained.

In the seventh invention of the present application, the valve body and the valve body operating member of operating the valve body are formed integral with each other, and the valve body operating member is adapted to impel the valve actuating member to action.

In the eighth invention of the present application, the valve body is opened only when the developing device needs the supply of toners, and closed when the supply is over, so that the entry of air into the toner container can be fully prevented. In the ninth invention of the present application, the working member provided in the developing device may cause more simple coupling and non-coupling of the connecting member of the toner cartridge and the valve body operating member of the developing device.

Brief Description of Drawings

Fig.1 is a front view of a toner cartridge in accordance with one mode of practice of the present invention,

Fig.2 (A) is a plan view of a discharge member of said cartridge, fig.2(B) is a longitudinal section view of the discharge member, and fig.2(C) is a sectional view of a valve body operating member of the device such as copiers,

Figs.3(A), (B),and (C) are sectional views showing toner discharge procedure steps in said cartridge,

Figs.4(A) and (B) are views explanatory of the internal structures of toner cartridges in accordance with another mode of practice of the present invention,

Fig.5 is a perspective view of the discharge member of a toner cartridge in accordance with further mode of practice of the present invention,

Fig.6 is a sectional view of the discharge member of a toner cartridge in accordance with another mode of practice of the present invention,

Fig.7 is a sectional view of the discharge member of a toner cartridge in accordance with further mode of practice of the present invention, (A) showing a closed position, and (B) an opened position,

Figs.8(A), 8(B), 9(A), 9(B), and 9(C) are sectional views explanatory of the courses for the operations of the valve body;

Fig.10 is a semi sectional view of the discharge member of a toner cartridge in

accordance with further mode of practice of the present invention,

Fig.11 is a perspective view of the discharge member of a toner cartridge in accordance with further mode of practice of the present invention, and

Fig.12 is a perspective view of a toner cartridge in accordance with further mode of practice of the present invention.

Fig.13 is a plan view of the toner cartridge in accordance with another embodiment of the present invention;

Fig.14 is a view explanatory of part of a slide lever serving as a working member in accordance with the embodiment of the present invention;

Fig.15 is a view showing part of the slide lever serving as working member in accordance with the embodiment of the present invention, and explaining the state in which it is at work;

Fig.16 is a plan view of the slide lever in accordance with the embodiment of the present invention;

Fig.17 is a front view of the slide lever in accordance with the embodiment of the present invention;

Fig.18 is a side view of the slide lever in accordance with the embodiment of the present invention; and

Fig.19 is a view explanatory of the working member in accordance with further embodiment of the present invention.

Best Mode for Carrying Out the Invention

Now, the best mode for carrying out the present invention will be illustrated together with the accompanying drawings.

First, a toner cartridge in accordance with a first mode of practice will be described with reference to figs.1 to 3.

This specific toner cartridge comprises a toner container 1 containing powder or liquid toner for use in developing devices, and a discharge member 2 for supplying for supplement the toner from said toner container to the developing device.

In this mode of practice, the entire toner container 1 is a shrinkable member of shrinking according to the amount of toner reduced in the toner container. Specifically, the toner container as a whole is constituted by a resilient bag called "pouch". The bag is made of synthetic resin film. The film may be of a

single layer, or a composite film composed of several kinds of films built up in layers. Alternatively, the bag may be a paper bag or cloth bag having resin film layers formed thereinside, or the so-called bag-in-box such as a paper box contained in a container which is more rigid than the film.

The discharge member 2 is located in a proper position in the toner container 1. Referring to Fig.l, since the toner container 1 is a pouch which has been heat-sealed all therearound, the discharge member 2 is provided in the middle of a heat-sealed portion 11, but it may be disposed in a corner portion 12 or the central portion 13 of the bag.

The discharge member 2 comprises a base portion 21 securely fixed to the container 1 by a proper fixing means such as welding or bonding, and a valve body 3 arranged such that it may move to or away from the base portion. The base portion 21 is formed with a guide passage 22 communicating with the interior and exterior of the toner container 1. The guide passage 22 is provided with an outlet 23 which is closed by said valve body 3. In this example, the valve body 3 is placed in the inner side relative to the outlet 23 (inward of the toner container 1).

The valve body 3 has a main fitting member 31 formed on the outer periphery thereof for closing the outlet 23 by fitting in the outlet 23. That is, in this example, the valve body 3 represents the main fitting member on its outer periphery, and the entire outlet 23 is a main receiving member. There is provided in the middle portion of the valve body 3 a connecting portion 32 of forcibly fitting onto a valve body operating member 4 of the developing device such as copiers. More specifically, a distal end 41 of the valve body operating member 4 is a sub fitting portion, and the connecting portion 32 of receiving the distal end 41 of the valve body operating member 4 is a sub receiving portion. Said forced fitting is realized by deformation of at least one of the sub receiving portion 32 and the sub fitting portion 41. Particularly herein, the distal end 41 of the valve body operating member 4 includes a narrow part 41a into which may fit a ridge 33a formed inside the connecting portion 32.

The valve body 3 may be separate from the base portion 21 of the discharge member 2, but in this example, it is formed integral with the latter so as to be guided by a guide portion 5. This guide portion 5 is composed of struts 51, 51 provided on the base portion 21 and arm portions 52, 52 extending from the

struts 51 inward. In this example, the struts 51 and arm portions 52 are formed on either side of the base portion respectively, but they may be one, or three or more. The arm portion 52 is pivotable at its base end relative to the strut 51, while it is pivotable at its distal end relative to the valve body 3. In this example, as shown in fig.2, when the valve body 3 is in the connection with the outlet 23, the distal end of the arm portion 52 is positioned below the base end, but as shown in fig.3(C), when the outlet 23 is out of contact with the valve body 3, and thus in the opened position, the distal end of the arm portion 52 is above the base end.

Furthermore, in this example, the struts 51, 51 extend beyond the arm portions 52 and further upward, and a stopper 53 is laid between both extensions of the struts 51, 51 on the level above the arm portions 52. If the valve body 3 has come to an elevated position, the stopper 53 abuts the valve body 3 to prevent the valve body 3 from going further upward. Other means to check further rise may be used. Therefore, this stopper 53 is not always essential.

Next, the valve body operating member 4 in the developing device will be described. Whenever a sensor detects the amount of developer in the developing device or of ink in the toner reservoir of a hopper, which has been used for a piece of paper, the valve body operating member 4 starts up so that toners will be discharged from the cartridge. Also, every time a predetermined amount of toner used is caught by a sensor, the valve body operating member 4 is put in motion to allow discharge of toners from the cartridge for further supply of the amount of toners corresponding to the amount of toners used up within the reservoir of the hopper. In this example, the valve body operating member 4 is actuated to approach the valve body 3 when the discharge of toner is needed, while it is separated from the valve body 3 and thus in the rest position when there is no need for toner to be discharged.

The valve body operating member 4 may be used as a separate one from a toner discharge pathway, but in this example, it also has the function of the toner discharge pathway.

Specifically, the valve body operating member 4 takes the shape of a shaft, so as to be received by the guide passage 22 of the discharge member 2, having a toner discharge pathway 42 formed thereinside and an opening portion 43

extending from the toner discharge pathway 42 to the outside and provided near the distal end of the valve body operating member 4. The distal end 41 of the valve operating member 4 is, as aforementioned, received by the connecting portion 32, and includes narrow part 41a which is adapted to fit onto the ridge 33a of the connecting portion 32. The opening portion 43 is formed on the base end side of the narrow part 41a. So to speak, the opening portion 43 makes it possible to allow the toner container to communicate with the inside and outside thereof when the main fitting portion 31 is out of contact with the outlet 23 (in an opened position). In this example, in the opened position, the opening portion 43 is positioned inward of the outlet 23 (the inner side of the toner container).

There is provided sealing means such as an O-ring 44 in a proper position of the outer periphery of the shaft of the valve body operating member 4 at the base end side of the opening portion 23. A seal is formed by said sealing means between the valve body operating member 4 and the guide passage 22 of the discharge member 2. This sealing means is not always necessary, but the sealing means may completely avoid any leakage of toners which fell short of the discharge pathway 42 from the opening portion 43.

Next, the supply method for toner by means of the toner cartridge will be explained. First, the cartridge as shown in fig.1 is placed in position in the developing device. At this initial stage, the valve body operating member 4 and the discharge member 2 stand separated from each other, or as shown in figs.3(A) and (B), the valve body operating member 4 and the discharge member 2 are in close connection with each other, and the toner outlet 23 is kept in a closed position by the valve body 3. In other words, the outlet 23 and the main fitting portion 31 are in a fitting relation with each other. In particular, it is preferable that such a fitting relation provide a forced fitting where the main fitting portion 31 is so forcibly fitted into the outlet 23 that the outlet 23 is deformed so as to expand the diameter of thereof. Said forced fitting may be effected by elastic deformation of the outlet 23. Deformation of at least one of the outlet 23 and the main fitting portion 31 will suffice.

In the supply of toner, the valve body operating member 4 approaches the valve body 3, and further goes upward until the outlet 23 is disconnected from the main fitting portion 31 (figs.3(B) to (C)). In this example, the disconnection between the outlet 23 and the main fitting portion 31 immediately gives rise to a

connection between the connecting portion 32 of the valve body 3 and the distal end 41 of the valve body operating member 4. This resultant fitting is necessary for the closing operation of the valve body 3 but not for the opening operation of same.

If the valve body operating member 4 further thrusts up the valve body 3, the arm portion 52 ascends with the result that such an elevated position may be retained. In this state, the valve body 3 is apart from the outlet 23 and thus in the opened position, and the opening portion 43 of the valve body operating member 4 is located in an inward position relative to the outlet 23 so that toner in the container is ready to be discharged through the toner discharge pathway 42 to the outside.

In this example, because the discharge member 2 is provided at the lower portion of the toner container 1, and arranged such that it may proceed to an opened position by elevating the valve body member 4, the toner will fall by gravity from the opening portion 43 of the valve body operating member 4, past the discharge pathway 42, and to the toner reservoir such as hoppers. However, it is possible to discharge toners by applying pressure to the toner container. In that case, it is also possible to provide the discharge member 2 on the upper portion or lateral side of the toner container 1. In any case, the toner container 1 may be deformed according to the amount of toner contained thereinside so as to maintain itself airtight.

Particularly, in this example, as the valve body operating member 4 has the function of toner discharge pathway, too, it may supply toner without introducing air from outside during the discharge of toner.

When the supply of a desired quantity of toner is over, the valve body operating member 4 retreats to proceed to the state as shown in fig.2, fig.3(A), or fig.3(B). That is, the valve body operating member 4 goes back together with the valve body 3 on the ground that the valve body operating member 4 is designed to join the connecting portion 32 of the valve body 3 when such a retreatment takes place. Then is reached the position in fig.3(B), namely where the outlet 23 and the main fitting portion 31 have come in contact with each other, thereby resulting in the toner discharge being stopped. The strength of a fitting connection between the distal end 41 of the valve body operating member 4 and the connecting portion 32 (sub receiving portion 32) is higher than the force

required for fitting the main fitting portion 31 into the outlet 23 (main receiving portion 23), and thus, a forced fitting connection may be established between the outlet 23 and the main fitting portion 31 in case the valve body operating member 4 is brought into connection with the connecting portion 32 of the valve body 3.

If the valve body operating member 4 is further retreated, the connection between the valve body operating member 4 and the connecting portion 32 of the valve body 3 is dissolved as shown in fig.3(A), and as shown in fig.2, the both members 3 and 4 proceeds to a separate position. In any position, a fitted connection between the main fitting portion 31 of the valve body 3 and the outlet 23 may established by retreatment of the valve body operating member 4 with the connecting portion 32 of the valve body 3 coupled therewith. This connection may ensure the prevention of toner leakage, and besides, since the discharge member 2 can be molded integrally from resin, the production cost may be cheapened. Moreover, a simple operation such as advancement and retreatment of the valve body operating member 4 may enable discharge of toner and prevent any leakage of toner.

In the above example, when the valve body operating member 4 of the developing device proceeds relatively to a discharge position, the connection between the main fitting portion 31 and the outlet 23 is dissolved with the connecting portion 32 and the valve body operating member 4 kept in the fitting connection with each other. The fitting connection between the connecting portion 32 and the valve body operating member 4 does not completely need to be executed in this stage but in the next stage when the valve body operating member 4 of the developing device proceeds relatively to non-discharge position. Also, in the above example, the connection between the connecting portion 32 and the valve body operating member 4 is designed to be removed at the time when the main fitting portion 31 has been fitted into the outlet 23, but the connection between said both members is preferably maintained. That is, once the connecting portion 31 has been connected with the valve body operating member 4 when the cartridge is mounted in the developing device, in every toner supply operation, the valve body 3 may be opened or closed with such a connection retained, and it is preferable that said connection between the connecting portion 32 and the valve body operating member 4 be broken when

the cartridge is removed from the developing device.

Fig.4 illustrates a variation of the toner container. In the previous mode of practice, the entire toner container is shrinkable dependent on the amount of toners consumed within the toner container. In the example as shown by fig.4, a larger half of the container constitutes a shrinkable portion 102. Specifically, the toner container 101 comprises shrinkable said portion 102 and a nonshrinkable portion 103 having a discharge member 2. The nonshrinkable portion 103 , which is made of soft resin, is rigid against collapse under the atmospheric pressure, while the shrinkable portion is made of soft resin and resilient enough to deform under the atmospheric pressure. The shrinkable portion 102 is resilient to such a degree that it may stick to the inside of the nonshrinkable portion 103, whereby the shrinkable portion 102 shrinks according to the amount of a toner used up thereinside and without allowing entry of air until the shrinkable portion 102 is finally put in touch with the nonshrinkable portion 103 (no internal space exists).

A toner container 111 as shown in fig.4(B) has a nonshrinkable portion 112 formed by a cylinder having a fixed internal configuration. A shrinkable portion 113 is fitted in the nonshrinkable portion 112 so that it is slidable relative to the nonshrinkable portion 112. The toner container 111 tends to shrink in its internal volume by the shrinkable portion 113 sliding axially. A discharge member 2 is provided in the nonshrinkable portion 112.

In any of the both examples in figs.4(A) and (B), the contour of the toner container may be formed by nonshrinkable members 104, 114. In fig.4(A), the nonshrinkable member 104 is disposed outside of the shrinkable portion 102 to connect with or integral with the nonshrinkable portion 103. An air guide passage 105 is provided in the nonshrinkable member 104.

Referring to fig.4(B), the nonshrinkable member 114 is disposed outside of the shrinkable portion 113 to connect with or integral with the nonshrinkable portion 112. An air guide passage 115, however, is provided in the nonshrinkable member 114. Next, another practicable modes of the discharge member are as follows. These modes of the discharge member are adaptable to the above-described toner containers. In the following modes of practice, portions or parts substantially identical to those in the previous modes of practice shall have like symbols and no further explanation added thereto.

In an example as shown by fig.6, the position of the opening portion 43 is different from that in the previous mode of practice. In the previous example, when the valve body 3 is in the opened position where it is separate from the toner outlet 23, the opening portion 43 of the valve body operating member 4 is placed in an inner position relative to the outlet 23 so that the toner within the container may be discharged from the toner discharge pathway 42 outward. With this example, in the opened position, the opening portion 43 of the valve body operating member 4 is located in an outer position relative to the outlet 23. That is, a liason portion 131 which is smaller than the outlet 23 in diameter is interposed between the opening portion 43 and the distal end 41 of the valve body operating member 4 fittable in the connecting portion 32 of the valve body 3. In this example, when the valve body 3 is urged to separate from the outlet 23 into an opened position, the liaison portion 131 comes flush with the outlet 23 so as to enable toners to pass between the outlet 23 and the liaison portion 131 to flow out. Then, the outflows run through the opening portion 43 and the toner discharge pathway 42 to the outside. The present example is substantially the same as the previous mode of practice in the relationships between the main fitting portion and the main receiving portion, and the sub fitting portion and the sub receiving portion: and the strength of forced fitting between each pair of the portions.

Fig.5 illustrates an example in which the valve body 3 of the first mode of practice is formed separate from the outlet 2, except that the present embodiment is substantially the same as the previous embodiment in the relationships between the main fitting portion and the main receiving portion, and the sub fitting portion and the sub receiving portion; and the strength of forced fitting between each pair of the portions. In this example, members for guiding the valve body 3 to a proper sliding are provided on the base portion 21 so as to surround the valve body 3. Specifically, a plurality of guide columns 121 are mounted perpendicular to and on the base portion 21. This arrangement enables the valve body 3 to move axially without any lateral motion under the guidance of the guide columns 121. A simple contact between the guide columns 121 and the valve body 3 will suffice. However, the concrete structure for guidance may be suitably changed; for example, there may be provided in the valve body 3 holes in which the guide columns 121 are slidably mounted.

Fig.7 is a sectional view in accordance with further practicable mode of the present invention, (A) showing a closed position, and (B) an opened position.

In the example of fig.2, there is provided stopper 53 between the struts 51, 51. This example is different from the example of fig.1 in that the stopper is not provided. The valve body 3 is connected with the base portion 21 and two arm portions 141, 141. These arm portions 141,141 may change their forms from the in-curved position as shown by fig.7(A) to the upward spreading position as shown by fig.7(B). The arm portions 141, 141 are strong and resilient to such a degree that they may permit the valve body 3 to move up and down in a vertical direction and support the valve body 3. This example is also substantially the same as the previous embodiment in the relationships between the main fitting portion and the main receiving portion; and the strength of the forced fitting between each pair of the portions.

The fact that the valve body 3 lowers from the state as shown in fig.7(B) to that as shown in fig.7(A) to close the outlet 23, when the connection between the connecting portion 32 of the valve body 3 and the distal end 41 of the valve body operating member 4 is not released will be further explained.

First, in the state of fig.7(B), the connecting portion 32 of the distal end 41 of the valve body operating member 4 and the valve body 3 still remain in contact with each other.

Next, as the valve body operating member 4 goes down, the valve body 3 moves downward, too.

When the lower end portion 3e of the valve body 3 approaches the outlet 23 to enter the latter, the lower end portion 3e joins with the inner periphery of the outlet 23, and then, the lower end portion 3e will be exposed to a force on a portion extending from its outer periphery to the center of its interior, whereby the lower end portion 3e of the valve body 3 will be subjected to a force from the inner periphery of the outlet 23, said force being inclined to squeeze the lower end portion 3e to reduce the inner diameter of the latter. As a result, the strength in fitting of the distal end 41 of the valve body operating member 4 and the connecting portion 32 of the valve body 3 will get so strong that there is no risk of the distal end 41 slipping from the connecting portion 32 of the valve body 3.

Thus, the lower end 41 of the valve body operating member 4 is transmitted

downward, keeping a secured contact with the valve body 3, so as to enable the main fitting portion 31 of the valve body 3 to surely fit with the outlet 23.

Now, the movement of the outlet 23 for opening and closing will be described in further detail with reference to figs.8 and 9, which are enlarged views of the main movements of main portions as shown in fig.7.

Fig.8(A) shows the valve body 3 which is in fitting relation with the outlet 23. In this state, the valve body operating member 4 is not shown in this view of drawing because it is located far beneath the valve body 3. In such a fitting relationship, the seal face 3f of the peripheral portion of the valve body 3 is closely attached to the inner periphery of the outlet 23 to give a highly airtight or watertight sealing. A shoulder portion 3g at valve body's side of the lower portion 3e of the valve body 3 overhanging the exterior is in engagement with a shoulder portion 23a at outlet's side of the lower portion of the outlet 23 overhanging the interior. This may prevent any sudden release of the valve body 3 from the outlet 23.

As shown by fig.8(B), the valve body operating member 4 goes upward and enters the connecting portion 32 within the valve body 3. Since the outer diameter of the distal end of the valve body operating member 4 is smaller than the inner diameter of the lower end portion 3e of the valve body 3 (particularly, the inner diameter of the ridge 33a protruding to the inner periphery of the lower end portion 3e), the distal end 41 can gain easy entry. And the distal end 41 of the valve body operating member 4 increases gradually in outer diameter from the most distal end to a narrow part 41a to become larger than the inner diameter of the lower end portion 3e of the valve body 3. Therefore, as the valve body operating member 4 advances, the lower end portion 3e of the valve body 3 deforms so as to expand outwardly, thus resulting in expansion of its inner diameter. In this connection, a proper space 3h is provided between the lower inner wall surface of the outlet 23 and the lower end portion 3e of the valve body 3 to permit eventual expansion of the lower end portion 3e of the valve body 3 (see fig.8(A)).

As the entry of the valve body operating member 4 goes further, the lower end portion 3e of the valve body 3 enters the narrow part 41a of the valve body operating member 4 until the expanded lower end portion 3e returns to the original state, as shown in fig.9(A).

As the entry advances further, the valve body 3 disengages from the outlet 23 with the lower end portion 3e of the valve body 3 resting in the narrow part 41a of the valve body operating member 4, as shown in fig.9(B). At this time, because the lower end portion 3e of the valve body 3 is inside the narrow part 41a of the valve body operating member 4, the engagement of the shoulder portion 3g at valve body's side in the lower end portion 3e of the valve body 3 and the shoulder portion 23a at outlet's side in the outlet 23 may be dissolved moderately.

Finally, as shown in fig.9(C), the opening portion 43 of the valve body operating member 4 is adapted to be positioned inwardly of the outlet 23, thereby enabling discharge of toners.

When the outlet 23 is closed by the valve body 3, the process is performed in a reverse way to the above-described; the valve body operating member 4 is pushed downward from the position as shown by fig.9(C). Then, the lowermost end of the lower end portion 3e of the valve body 3 can enter the outlet 23 without strain now that the inner diameter of the opening end of the outlet inside of the toner container is designed to be larger than the outer diameter in the lowermost end of the lower end portion 3e of the valve body 3.

As illustrated by fig.9(B), the outer diameter of the shoulder portion 3g at valve body's side in the lower end portion 3e of the valve body 3 is larger than the inner diameter of the outlet 23. Thus, if the valve body operating member 4 is pushed further downward, the lower end portion 3e of the valve body 3 will deform inwardly by receiving a force from the inner wall of the outlet 23 so as to enter the narrow part 41 of the valve body operating member 4. This action grows larger as lowering of the valve body operating member 4 increases further, and the narrow part 41a of the valve body operating member 4 surely engages with the lower end portion 3e of the valve body 3. This will result in avoidance of the valve body 3 coming off the valve body operating member 4.

Further lowering of the valve body operating member 4 may cause the valve body 3 to abut against the end portion of the outlet 23 to ensure that the valve body 3 will stop its descent(see fig.9(A)). With the lowering of the valve body operating member 4 being further increased, the lower end portion 3e of the valve body 3 expands outwardly, followed by disengagement of the narrow part 41a from the projection 33a protruding to the inner periphery of the lower end

portion 3e of the valve body 3 (fig.8(B)), thereby causing a return to the original state (fig.8(A)).

Fig.10 is a perspective view of a main portion of the toner cartridge in accordance with further mode of practice of the present invention.

A discharge member 201 in accordance with this mode of practice, which is made of synthetic resin, includes a substantially cylindrical base portion 202 having a flange portion 203 formed on the lower end thereof. The base portion 202 is fixedly secured to a toner container 204 by hot welding. In the drawing, arm portions 205, 205 rise from the both sides of the upper end of the base portion 202 to extend toward the center therebetween respectively. There is provided a valve body 206 connected in series with the distal end of the arm portions 205, 205.

A through-guide passage 207 is provided extending in a vertical direction in the middle of the base portion 202 of the discharge portion 201. The upper end of the guide passage 207 provides an outlet 208, whose lower end forms an engaging step 208a.

A main fitting portion 209 with which the valve body 206 is formed is adapted to engage with the outlet 208 (i.e. a sub fitting portion). Namely, the outer periphery of the lower end of the valve body 206 constitutes main fitting portion 209. An engagement of this specific main fitting portion 209 of the valve body 206 with the engaging step 208a of the outlet 208 may lead the outlet 208 into a closed position. In this case, the both arm portions 205, 205 resiliently bend in response to the vertical movement of the valve body 206 and has a sufficient strength to support the latter.

Inside of the valve body 206 is provided a connecting portion 213 which is connected with the distal end of a valve body operating member 211 which acts to give directions for toner discharge, and an engaging step 214 is formed extending in a peripheral direction in the lower part of the inner periphery of the connecting portion 213.

The valve body operating member 211 for supplying toners to the toner container 204 is like a rod in shape, having a tip-connecting portion 212 (sub fitting portion) formed on the distal end portion thereof so as to be received by the connecting portion 213 of the valve body 206. An engaging groove 215 is formed extending in a peripheral direction in the lower part of the tip-

connecting portion 212 so that the engaging groove 215 may engage with the engaging step 214 of the valve body 206. The valve body operating member 211 serves as a toner discharge means, too, including a toner discharge pathway 215 formed longitudinally of its center, and a plurality of opening portions 216 formed extending in a peripheral direction a little below the tip-connecting portion 212.

The lower part of each opening portion 216 is a little larger than the upper part of same in outer diameter, and its outer diameter is substantially identical to the inner diameter of the guide passage 207 of the discharge portion 201.

The valve body operating member 211 goes up until the step portion 217 formed around the entire periphery is brought into contact with the lower end of the outlet 208, and the valve body 206 is lifted accordingly, so that the opening portion 216 advances inward of the toner container relative to the outlet to ensure that the toner is ready for supply (fig.10).

After the termination of toner supply, the valve body operating member 211 retrogresses to the guide passage 207 of the discharge portion 201. At this time, now that the valve body 206 is in contact with the distal connecting portion 212 of the valve body operating member 211 through the connecting portion 213, the valve body 206 is drawn toward the outlet 208 (to the lower part of the drawing), whereby the main fitting portion 209 of the valve body 206 is fitted in the outlet 208 to close the latter. This example is also substantially the same as the previous modes of practice in the relationship of the main fitting portion and the main receiving portion, and the sub fitting portion and the sub receiving portion; and the strength of a forced fitting between each pair of the portions of each group.

Fig.11 is a perspective view explanatory of the main part of the toner cartridge in accordance with further mode of practice.

In the previous example, the valve body operating member 4 is provided with the toner discharge pathway, but herein, this figure of drawing shows a valve body operating member free from toner discharge pathway.

An outlet 301 is made from synthetic resin, disposed on the peripheral edge of a toner container 302, and formed with a cylindrical base portion 303 having a flange portion 304 formed at the lower end portion thereof. Said base portion 303 is joined by hot welding to the peripheral edge of the toner container 302. In

the drawing, a guide passage 305 extends through the base portion 303 for communication with the inside and outside of the toner container 302. Arm portions 306, 306 are formed opposite to each other with the guide passage 305 interposed therebetween, extending from the upper part of the base portion 303 upward to the center point respectively until the distal ends of the arm portions 306, 306 are joined to a valve body 307. The valve body 307 has a substantially spherical shape, and the outer periphery of the valve body 307 represents a main fitting portion 311.

As aforementioned, the guide passage 305 is provided extending in a vertical direction in the middle of the base portion 303, having an outlet 308 formed over the upper end of the guide passage 305 in such a manner that the main fitting portion 311 of the valve body 307 may be received airtight by the outlet 308. The outlet 308 has an inner periphery so inclined that its inner diameter gradually increases upward.

Both the arm portions 306, 306 may bend resiliently in response to the vertical movement of the valve body 307 and has a sufficient strength to support the latter.

A rod-shaped valve actuating member 309 is provided extending from the bottom of the valve body 307 downward to pass through the guide passage 305.

The valve actuating member 309 has a guide plate 310 formed in the middle thereof. The guide plate 310 helps center the valve actuating member 309 so that the former may properly guide the latter inside of the guide passage 305, and the guide plate 310 may also act to seal the guide passage 305 when the valve actuating member 309 is pushed downward.

Specifically, when the outer diameter of the guide plate 310 is identical to or larger than the inner diameter of the guide passage 305, the guide plate 310 is brought into a close contact with the guide passage 305, so that when the valve actuating member 309 moves up and down, the guide plate 310 may center the valve actuating member 309 for a sure guidance. The guide plate 310 may also play the role of a covering by which the guide passage 305 is sealed during the vertical movement of the valve actuating member 309.

If the outer diameter of the guide plate 310 is larger than the inner diameter of the guide passage 305, the guide plate 310 must be made of a resilient and elastic material, and if the outer diameter of the guide plate 310 is identical to

or smaller than the inner diameter of the guide passage 305, the guide plate 310 may be made of either rigid or elastic material.

The valve body operating member at the developing device side is not shown in Fig. 11, but it will do if it is capable of putting the valve actuating member 309 in a vertical motion. By way of illustration, a valve body operating member may be enumerated which acts to grasp the valve actuating member 309 by means of a chuck to move the valve actuating member 309 in a vertical direction by moving the chuck up and down. A member engageable with the lower end of the valve actuating member 309 may be used as a valve body operating member, which member may move up and down together with the valve actuating member 309 kept in abutment therewith.

A toner discharge pathway in the device such as copiers will do if it is capable of receiving discharges from the guide passage 305. The opening of the discharge pathway (not shown) may be a cylindrical element which is formed thereinside with a connecting hole which can discharge toner. Another cylindrical element is a type which can be fit into the guide passage 305 of the discharge member 301, or a type which can fit on the outer periphery of the flange portion 304 provided on the lower end of the discharge member 301.

The former type is preferably provided in the distal end thereof with a valve body operating member serving to give motion to the lower end of the valve actuating member 309 and in addition, there must be disposed between a pressing member and the inner periphery of the cylindrical member a space which allows toner to pass therethrough.

Similarly, in the case of the latter type, a valve body operating member serving to actuate the valve actuating member 309 must be formed extending from the upper end of the cylindrical element into a lower connecting hole, and there must be disposed between the pressing member and the inner periphery of the cylindrical member a space which allows toner to pass therethrough.

There may be available a process of discharging toner from the guide passage 305 direct into the toner reservoir of the device without the aid of a limited guide passage such as the cylindrical element.

The discharge process for toner in accordance with this mode of practice is as follows.

The valve actuating member 309 is engaged with the valve body operating

member of the device, and then pushed upward as it stands. This urges the valve actuating member 309 to move upward, thereby to separate the valve body 307 connected airtight with the outlet 308 from the latter to cause discharge of toner. In the termination of discharge, a reverse operation takes place so as to fit the main fitting portion 311 of the valve body 307 in the outlet 308, thus resulting in stop of toner discharge. At that time, even in the middle of the discharge operation, any extra discharge of toner may be avoided by the guide plate 310.

In this example, the valve actuating member 309 is formed integral with the valve body 307, but the both members may be formed separate from each other. In that case, an arrangement is available such that the valve actuating member 309 may be connected with the valve body 307 by a fitting operation. This fitting structure may be the same as that composed of the connecting portion and the valve body operating member in the mode of practice as shown in fig.2.

It will be understood from the above explanation that in this mode of practice, the valve actuating member 309 constitutes a part of the valve body 307 and the connecting portion relative to the valve body operating member of the device may be provided in a proper position such as the lower end of the valve actuating member. The valve body operating member of the device may be made similar to the valve actuating member 309 in configuration, and said valve body operating member may be connected with the valve body 307 by the same fitting structure as that composed of the connecting portion and the valve body operating member in the embodiment as shown in fig.2.

Fig.12 illustrates further mode of practice, in which the entire toner container 401 is made of hard thermoplastics. Materials, such as other hard synthetic resin or metal, which do not deform under the atmospheric pressure may selectively be used. A discharge member 2 may be of a similar type to those used in the previous embodiments, and may be mounted on the toner container 401 in a suitable place. The toner container 401 may be made rectangular, cubic, or columnar. In this example, the toner discharge member 2 is positioned on an end face 411, but it may be mounted on other place such as a square portion 412 or side face 413.

The method of use is the same as those in the previous modes of practice. Specifically, the toner container 401 is mounted on the device such as copiers in

such a manner that the discharge member 2 will be positioned in the lower end of the container (not shown). The valve body operating member is arranged such that it may put the toner container in an opened position by its elevation, as in the previous example. In this connection, the toner falls by gravity from the opening portion of the valve body operating member, past the discharge pathway and into the toner reservoir such as hoppers. However, the discharge of toner may also be achieved by applying pressure to the inner side of the toner container 401. In that case, the discharge member 2 may be disposed on the upper side of, or laterally of the toner container 401. In order to effect a high pressure in the toner container, an air inlet (not shown) is provided in a suitable section of the toner container 401, thereby to increase the pressure inside the container to carry out the discharge of toner. Even in the case of the discharge by gravity-drop, though no increase of the inside pressure is necessary, the air inlet (not shown) may be used to avert reduction of the inside pressure. Alternatively, a conveying screw or agitator may be mounted inside of the toner container 401 so as to send the toner to the discharge member 2 mechanically.

The present invention may be embodied in the foregoing modes of practice. In particular, it may be advantageously embodied in the following structures. In the toner cartridge comprising a toner container containing powder or liquid toner for use in the developing device, and a discharge member for supplying toner from the toner container to the developing device, the toner container is provided with a shrinkable portion which may shrink according to the amount of toner consumed within the toner container, and the toner discharge member is composed of a toner outlet, and a valve body adapted to open said outlet when a valve body operating member of the developing device is at work and to close said outlet when the valve body operating member of the developing device is at rest; and the valve body is formed with a main fitting portion of closing the outlet by fitting in the outlet. In this connection, as the outlet is closed by the valve body when the discharge of toner from the toner container comes to end, there will occur no leakage of toner. And besides, because the valve body and the outlet are fittingly (preferably forcibly) connected with each other, such a connection is not easily dissolved even by vibration to ensure that extra discharge or leakage of toner will be prevented. Furthermore, since the toner container may shrink according to the discharge of toners within the toner

container on the basis that the toner container is formed with a shrinkable portion of shrinking in response to the reduced amount of toners within the toner container, the toner discharge can be carried out without any risk of air invasion of the container. As a result, the quality of toner contained in the container can be preserved well intact . Additionally, by providing a toner discharge pathway in the valve body operating member, or connecting a cylindrical outlet at the device side direct with the guide passage 305, the interior of the toner container is connected direct with the toner reservoir via a sealed pathway, thereby to preclude any invasive risk of the open air. This enables supply of toner to the device in a more stable mode. In the above-described embodiments, different kinds of methods for filling the toner container with toner may be utilized. Employment of a reverse procedure to the discharge may readily obtain more desirable filling conditions. With the valve body operating member with a toner discharge pathway, this toner discharge pathway may be used as a pathway for filling purpose in a toner-filling device. In other words, the valve body operating member may be utilized as a nozzle for filling purpose in the toner-filling device. In the embodiment as shown by fig.9, the toner discharge pathway of the cylindrical member may be used as a toner-filling pathway (not shown). Namely, such a filling pathway may be constituted by a guide passage 305 in the form of a cylinder. Specifically, the opening of the filling pathway may constitute a cylindrical member having a connecting hole which can fill the container with toner. In addition, this cylindrical member may be of a type which is fittable into the guide passage 305 of the discharge member 301, or which can fit on the outer periphery of the flange portion 304 located on the lower end of the discharge member 301. In particular, in the use of the toner container provided with the shrinkable portion, when the shrinkable portion is in a shrink position, the toner container may be filled with toner by supplying the toner from the discharge member. Thus, since the toner container can be filled with toner with air rarely got mixed therewithin, the container can be almost completely filled with toner so that the toner can be preserved without deterioration for long periods. And as the filling operation takes place with substantially none of air remaining in the container as a result of the complete shrink of the shrinkable portion of the toner container, the filling operation can be performed with a high speed without necessity of eliminating air from the

container or introducing air into the container.

Various modifications and alterations of the present invention may be made outside the modes of practice set forth herein. For example, the arm portions in the modes of practice of this invention may be always biased downward (in a direction in which the valve body will close the outlet). The guide plate 310 may be provided in any of the valve body operating members in accordance with the other modes of practice . The toner may be allowed to drop by gravity for discharge, or a pressure may be applied from outside to the shrinkable portion of the toner container for a positive acceleration of discharge of toner.

A means may be represented as means of accelerating toner discharge positively for applying external pressure to the shrinkable portion of the toner container, using an apparatus of mechanically applying force, such as a piston. In the alternative, toners can be absorbed by means of a pump provided in the developing device. At any rate, except for the gravity-drop, means to positively accelerate the discharge of toners from the toner container by mechanical force or fluid pressure may be added for the toner discharge.

The above-described filling operation will be explained in further detail. If a toner discharge pathway is provided in the valve body operating member, this toner discharge pathway may be used as a toner filling pathway of the toner filling device. Specifically, the valve body operating member in the foregoing embodiments may be used as a filling nozzle of the toner filling device. Namely, the valve body operating member as illustrated in the embodiments is provided in the leading end of a powder supply line (not shown), such as a pipe or tube, provided in the toner filling device (not shown) to serve as filling nozzle. The toner filling device (not shown) is actuated to fill the toner container in, using a pressure applying means such as pumps provided in the toner filling device (not shown) or by gravity.

Referring to another form of filling operation, fig.13 shows a second discharge member 602 having the same structure as that of the discharge member 2 in the previous embodiments and provided in a toner container 601. This toner container 601 may be the toner container 1 formed with the same shrinkable portion as that of the previous embodiments or the toner container 401 not having a shrinkable portion but a high rigidity with which the toner container can resist change of form by the atmospheric pressure. In said toner container,

the discharge portion 2 of the toner container 601 is utilized as a toner filling pathway, and the valve body operating member 4 is used as filling nozzle of the toner filling device to fill the toner container 601 with toners. In that case, a valve body operating member 603 which is the same in shape as the valve body operating member 4 of the previous embodiments is connected with the second discharge member 602. The air within the toner container 601 is discharged from the second discharge member 602 through the valve body operating member 603. This may keep the pressure within the toner container 601 constant. In this case, it is preferable that air be discharged with a filter arranged in the passageway, using the second discharge member 602 having means for preventing discharge of toners, or the valve body operating member 603. Furthermore, the discharge of the air from the toner container 601 may be achieved in a natural way, or in an positive way by an absorbing means such as pumps (not shown). That is, the valve body operating member 603 is employed as absorbing nozzle connected with the absorbing means such as pumps to absorb the air within the toner container 601 from the second discharge member 602 and past the valve body operating member 603.

A pressure regulating valve or check valve may be substituted for the second discharge member 602 and valve body operating member 603. The second discharge member 602 is, however, advantageous in that a reliable closed position can be obtained by said special valve structure after the connection with the valve body operating member 603 has been dissolved.

After this toner filling process (i.e. after the stop of toner supply), the air can be discharged from the toner container 601. This may follow the discharge of air in the described filling process, or may be performed in another process. If the latter case is employed, a toner container with no second discharge member 602 (for example, toner container 1 with a single discharge member 2 as shown in fig.1) is available for practice. In this case, after the valve body operating member 4 used for toner filling has been removed from the toner container 1, the valve body operating member 603 connected with the absorbing means is connected to the discharge member 2 for absorbing operation. In this case, the provision of a filter in the discharge member 2 may render the toner discharge difficult, and therefore, it is preferable that the filter be arranged in the valve body operating member 603 connected with the absorbing means for the

purpose of prevention of toner leakage.

Using the aforementioned forced air absorption, air can be absorbed to such an extent that a vacuum or a state next to the vacuum is produced. However, too much absorption may cause the hardening of toners, resulting in decrease in its flowability, so the absorption of a quantity of air (air pressure) suitable for the preservation and availability of toners is desirable.

The absorption of air within the toner container may be appropriately carried out by the toner container 1 formed with the shrinkable portion, but the toner container 401 having a high rigidity and a strength sufficient to resist change of form by the atmospheric pressure can also do the same thing. The second discharge member can be used to discharge the air within the toner during and after the supply of toners to the toner container to adjust the air pressure within the toner container, or to introduce air or other fluids into the toner container. Additionally, such a discharge or introduction of fluids can be carried out during the transportation of the toner container or after the toner container has been set in the developing device. In particular, toners can be discharged from the toner container through the first discharge member in operation. Consequently, the second discharge member can be used for adjustment of the air and atmosphere within the toner container as needed.

Finally, an advantageous mechanism for attachment and detachment between the valve body at discharge member's side and the valve body operating member will be described. As a first example for the attachment and detachment is recited the manual or automatic dissolution of a coupling of the valve body at discharge member's side and the valve body operating member by the discharge member provided in the toner container which is actuated by a working member such as lever or spring as provided together with the valve body operating member at the developing device's side of copier.

As shown in figs.14 and 15, the valve body operating member 4 is secured to the developing device of copier with an opening 42c communicating with the toner reservoir of the developing device. More specifically, a supporting portion 45 is formed at the end side of the opening 42c of the valve body operating member 4 and fixed to the developing device. There is provided in this developing device a slide lever 501 as a working member for connecting and disconnecting the valve body 3 at discharge member's side and the valve body

operating member 4. The lever 501 has a long hole 503 formed on the upper face to extend in a direction in which the lever 501 slides. The valve body operating member 4 is sited within the long hole 503 so as to pass through the latter in a vertical direction. There is formed on the peripheral edge of the long hole 503 a flat portion 504 and a slope portion 505 gradually rising from the flat portion 504 backward (in a right-hand direction of fig.14, in other words, in a direction in which the slope portion 505 goes away from the valve body operating member 4). The flat portion 504 is spacious enough to rest thereon a flange portion 24 of the lower end of the discharge member 2 which is in contact with the flat portion 504 while the valve body 3 at discharge portion's side and the valve body operating member 4 are in fitting relationship. A fingering portion 506 is formed in the rear end of the slope portion 505 for pushing the lever 501 into sliding, under which a spring receiver 507 is provided.

On the other hand, there is another spring receiver 47 formed in the supporting portion 45 of the valve body operating member 4 in a section opposite to the spring receiver 507, and a spring 508 is interposed between the both spring receivers 507, 47. The spring 508 is intended for biasing the lever 501 backward at all times. The spring 508 is a compression coil spring. With the fingers put on said fingering portion 506, the lever 501 is advanced by pushing it forward (in a left-hand direction of fig.14, in other words, in a direction in which the slope portion 505 approaches the valve body operating member 4) against the biasing force of the spring 508, and then, the slope portion 505 goes under the flange portion 24 of the discharge member 2. As the lever 501 is further advanced, the slope portion 505 lifts the flange portion 24 with the result that the discharge member 2 will come out of the valve body operating member 4 (see fig.15). This may set the toner container provided with the discharge member 2 so free that the toner container can be taken out of the developing device of copiers by hand. After the discharge member 2 has been separated from the valve body operating member 4, the fingers are detached from the fingering portion 506, and then, the lever 501 goes back to the initial state under the influence of the biasing force of the spring 508.

When the toner container with discharge member 2 is mounted on the developing device of copiers, the discharge member 2 of the toner container is fitted onto the valve body operating member 4. In such an event, as

aforementioned, the lever 501 is in the retreated position, thereby providing no obstacle whatsoever, so that the discharge member 2 may be mounted on the valve body operating member 4 in a simple way. When this operation has been completed, the flange portion 24 of the discharge member 2 abuts against the flat portion 504, as shown in fig.14.

In order to obtain a secure sliding of said lever 501, there are provided on both sides of the lever 501 guided pieces 509, 509 facing downward, as illustrated by figs.16 to 18. These guided pieces 509, 509 are slidably fitted in guide grooves (not shown) provided in the developing device of copiers. The lever 501 may slide back and forth under the guidance of the guide grooves (not shown).

The above-described example is indicative of a mechanism for actuating the discharge member 2 to move to or away from the valve body operating member 4 fixed to the developing device. More specifically, said mechanism includes the lever 501 with slope because the latter is used to force the discharge member 2 into motion as a working member for attachment and detachment between the discharge member 2 and the valve body operating member 4, and the spring 508 because it is used to move the lever 501. However, this spring 507 is not always necessary. A design may be used that the lever 501 can be moved back and forth by hand or a drive such as an electric motor or air cylinder. The lever 501 may be of a horizontal- or vertical-movable type, or a type of lever that can lift the discharge member 2 using the principle of lever. A spring may be used to act direct on the discharge member 2 to lift it.

In the alternative, as a working member for attachment and detachment between the discharge member 2 and the valve body operating member 4, a member may be used that can support portions such as flange portion 24 within the discharge member 2 in a manner that they may move in a vertical direction. Such a working member can be used to not only separate the discharge member 2 from the valve body operating member 4, but also allow the discharge member 2 to come near the valve body operating member 4. For example, the relationship between the discharge member 2 and the valve body operating member 4 was indicated to included three different modes, i.e. the first one wherein the valve body 3 of the discharge member 2 and the valve body operating member 4 are kept separate from each other, the second one wherein the valve body 3 of the discharge member 2 and the valve body operating

member 4 are kept in a complete contact with each other, and the third one wherein the valve body 3 of the discharge member 2 and the valve body operating member 4 are not completely separate from each other, while the valve body 3 is in a closed position. In order that these three modes can be selected, the selection of the distance between the discharge member 2 and the valve body operating member 4 may permit the discharge member 2 to readily move to or away from the valve body operating member 4.

All what the working member for attachment and detachment between the discharge member 2 and the valve body operating member 4 has to do is to actuate at least one of the discharge member 2 and the valve body operating member 4 so that the discharge member 2 and the valve body operating member 4 will move to or away from each other. Thus, in the said example, the discharge member 2 was a movable element, but contrary to this, the discharge member 2 may be of a stationary type, while the valve body operating member 4 may be designed for a movable element. As a second example for the attachment and detachment recited an instance that in order to open and close the discharge member 2 provided in the toner container, the discharge member 2 is attached to or detached from the valve body operating member 4 by fixing the discharge member 2 to a fixing position so as to actuate the valve body operating member 4 manually or automatically. Fig.19 shows this specific example, wherein the discharge member 2 is rendered unmovable in a vertical direction by means of a fixing member 511 provided at the side of the developing device of copiers. In this example is shown discharge member 2 which is kept unmovable in a vertical direction by the flange portion 24 that has been forced into a hole provided in the fixing member 511. For example, a rigid toner container having no deformable part can be kept stationary by pressing the upper and lower ends thereof. The discharge member 2 or the toner container may be kept at rest by a mechanical device such as chucks. Proper measures may be taken to practice said methods for inability to move in a vertical direction.

On the other hand, the valve body operating member 4 is provided in the developing device so that it may move in a vertical direction. In this instance, a guided portion 512 is provided below the valve body operating member 4, while there is provided on the side of the developing device a guide 513 such as a guide groove which may receive said guided portion 512 so that it can slide in a

vertical direction. The attachment and detachment between the discharge member 2 and the valve body operating member 4 may be achieved by moving in a vertical direction a handle 514 extending from the valve body operating member 4 sideways. Fig.19 shows the valve body 3 of the discharge member 2 and the valve body operating member 4 in fitting relationship with each other. The valve body operating member 4 may be removed from the valve body 3 of the discharge member 2 by the valve body operating member 4 which is sledded downward by pushing down the handle 514.

In this instance was cited a valve body operating member 4 operable by hand-powered handle. However, as in the previous example, members with slope, or members which is driven by a mechanical device such as air cylinder or electric motor may be used. In either second example or first example, the attachment and detachment between the discharge member 2 and the valve body operating member 4 includes not only the transition from a position in which the valve body 3 of the discharge member 2 and the valve body operating member 4 are being coupled one to another to a position in which the both members are separate from each other but also the transition from the former position to an intermediate semicoupled position (the valve body 3 and the valve body operating member 4 are kept unseparated from each other but the valve body 3 is in a closed position). Furthermore, the working member preferably may help to realize or complete at least one of these transitions. Thus, for example, the working member may be designed to handle only the transition from a coupled position to an uncoupled position, and not the transition from an uncoupled position to a coupled position.

As previously noted, with an arrangement such that at least one of the discharge member 2 and the valve body operating member 4 is made movable, the attachment and detachment between the discharge member 2 and the valve body operating member 4 can be achieved by manually or automatically actuating the working member for moving the discharge member 2 and the valve body operating member 4 to or away from each other. This may save troubles necessary for said attachment and detachment, and render said operations easy.

Industrial Applicability

The present invention is usable in a toner cartridge for supplying powder or liquid toner (including printing ink) for use in copying machines, printers, or pressing machines and its opening and closing mechanism for toner pass-through.

Furthermore, the present invention is not limited to the toner container as set forth but is applicable to supply containers for many other kinds of liquids, powders, or particles and its opening and closing mechanism for pass-through.

The present invention is also usable for coffee, soaps, juices, syrups, paintings, detergent, cosmetics, chemical products, motor oil, adhesives, medicine, every sort of foods, drinks, inedible liquids, powders, or particles. It will be appreciated by those skilled in the art that further changes in design, and combinations are available based on the above descriptions.

CLAIMS

1. A toner cartridge comprising a toner container containing powder or liquid toners for use in developing device and a connecting member for supplying toners from said toner container to the developing device, characterized in that the connecting member includes a pass-through, said connecting member opening the pass-through provided thereon when the valve body operating member of said developing device is at work, and a valve body for closing the pass-through when the valve body operating member of the developing device is at rest, and the toners are discharged from the opened pass-through.

2. The toner cartridge as defined in claim 1, characterized in that the toner container includes a shrinkable portion of shrinking according to the amount of toners consumed within the toner container.

3. The toner cartridge as defined in claim 2, characterized in that the toner container may be filled with toners by pouring the toners from the connecting member in the shrinking state of the shrinkable portion of the toner cartridge, that the valve body has a main fitting portion of closing the pass-through by fitting in the pass-through, and a connecting portion of connecting with the valve body operating member of the developing device, and that when the valve body operating member of the developing device proceeds relatively to the nondischarging position, said connecting portion moves, while staying in contact with the valve body operating member, together with the valve body operating member for subsequent fitting connection between the main fitting portion and the pass-through.

4. The toner cartridge as defined in any of claims 1 to 3, characterized in that the toner container includes a second connecting member other than said connecting member, and the pressure within the toner container may be adjusted by the second connecting member which selectively maintains a ventilate communication with the outside.

5. The toner cartridge as defined in any of claims 1 to 4, characterized in that after the toner container has been filled with toners injected from the

connecting member, the discharge of the air within the toner container may be achieved by an air discharge means for discharging the air within the toner container without allowing any eventual leakage of the toners.

6. An opening and closing mechanism for pass-through of toner cartridge characterized in that a connecting member for supplying powder or liquid toners for use in developing device from the toner cartridge to the developing device comprises a body provided with a pass-through, a valve body for opening and closing the pass-through by moving to or away from the pass-through, a fixing means for rendering the valve body stationary with the pass-through kept closed, and a valve body operating member connected with the valve body for moving the valve body between opened and closed positions.

7. An opening and closing mechanism for the pass-through of the toner cartridge characterized in that the connecting member of the toner cartridge for supplying from the toner cartridge powder or liquid toners for use in the developing device comprises a body with pass-through, a valve body for opening and closing the pass-through by moving to or away from the pass-through, a fixing means for rendering the valve body stationary with the pass-through kept closed, and a valve actuating member formed integral with the valve body for moving the valve body between opened and closed positions, that said valve actuating member is provided stretching over the areas in and about the pass-through, and the valve body operating member provided in the outside of the pass-through urges the valve actuating member to move the valve body between the opened and closed positions.

8. An opening and closing mechanism for the pass-through of the toner container as defined in claim 6 or 7 characterized in that the valve body operating member is provided in the developing device, and that only when the developing device needs toner supply, the valve body operating member resumes placing the valve body in an opened position, and when the toner supply is over, the valve body operating member resumes placing the valve body in a closed position.

9. An opening and closing mechanism for the pass-through of the toner container as defined in any of claims 6 to 8, characterized in that a working member is provided in the developing device for moving the connecting member and the valve body operating member to or away from each other by moving at least one of the connecting member and the valve body operating member, and that the working member is manually or automatically operated.

FIG. 1

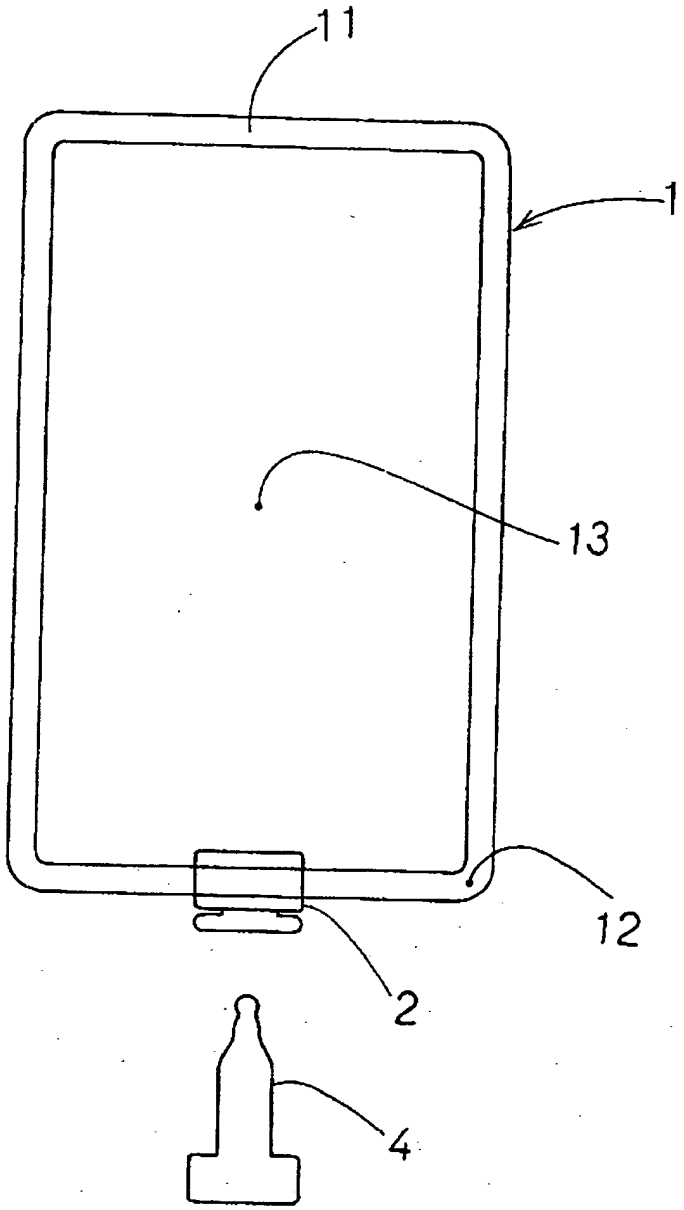

FIG. 2

(A)

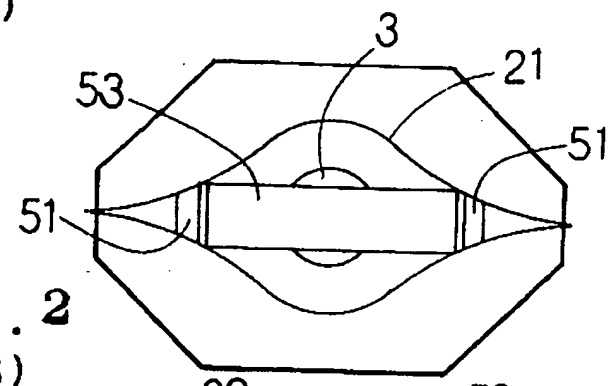

FIG. 2

(B)

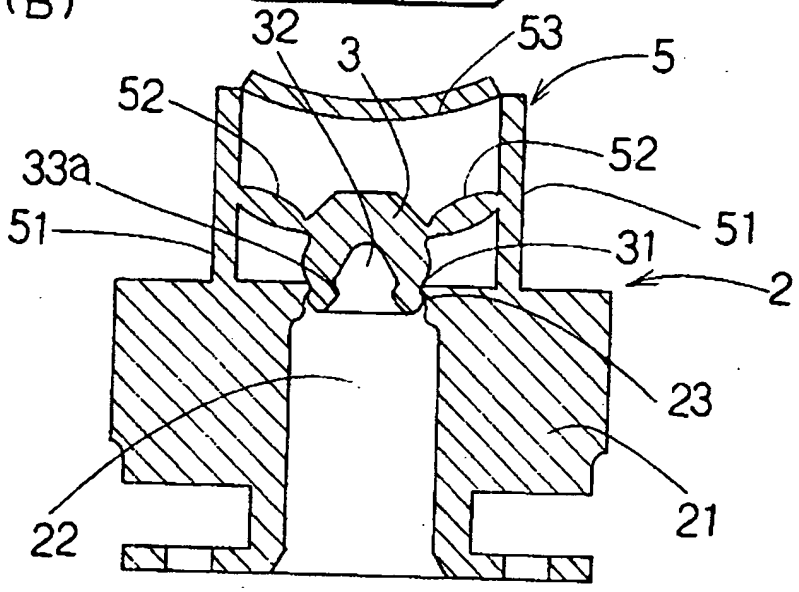

FIG. 2

(C)

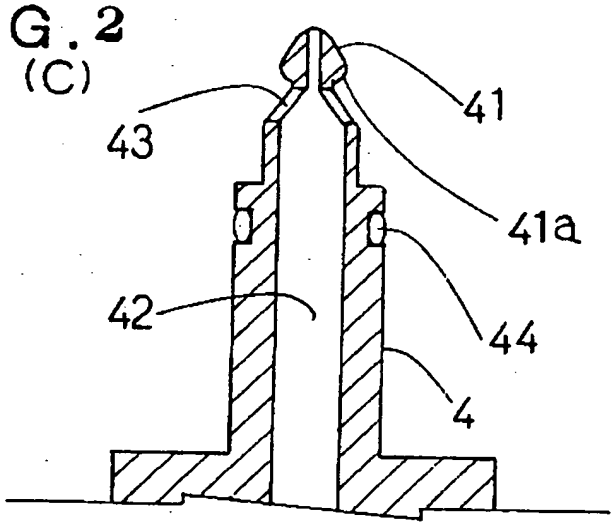

FIG. 3

(A)

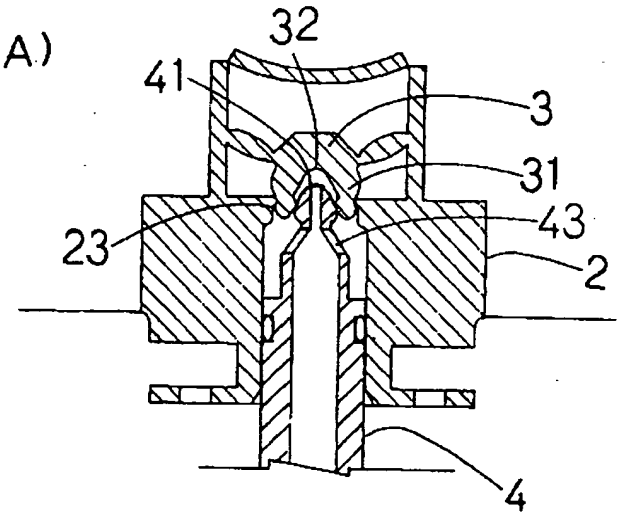

FIG. 3

(B)

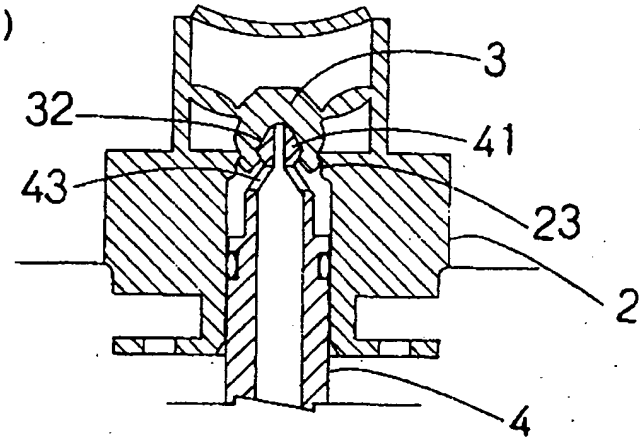

FIG. 3

(C)

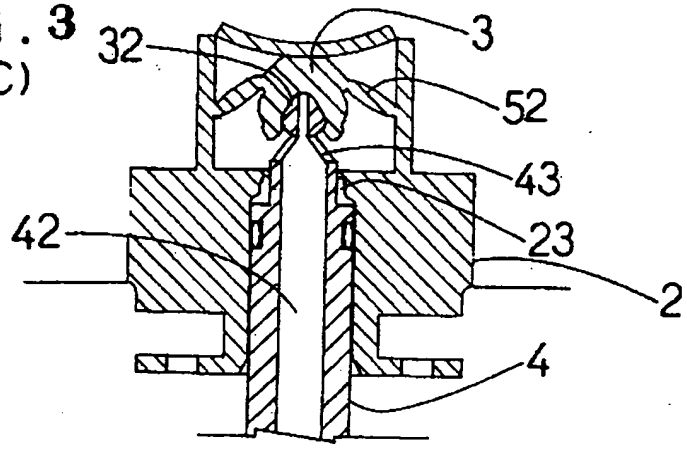

FIG. 4

(A)

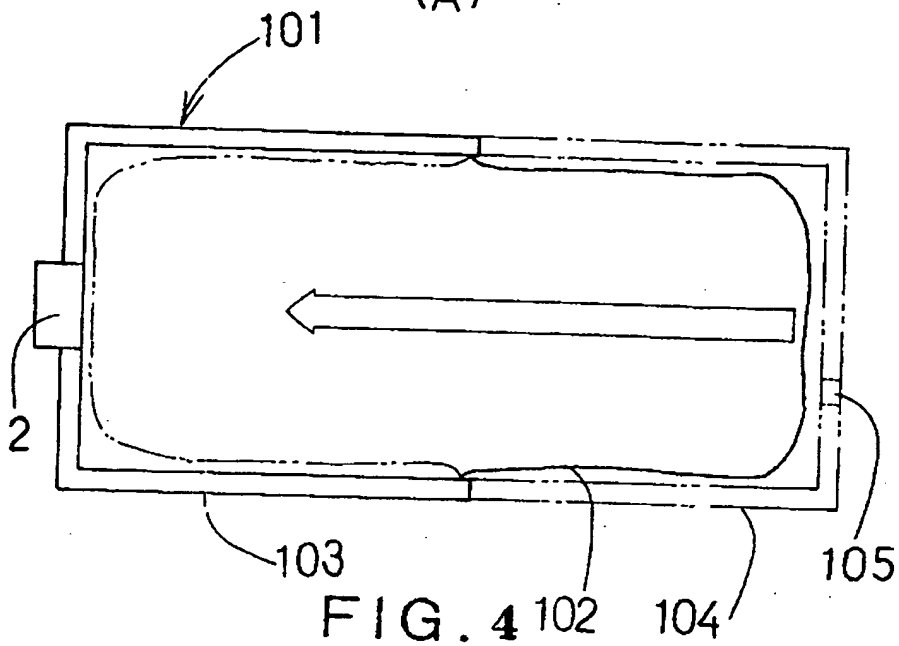

FIG. 4

(B)

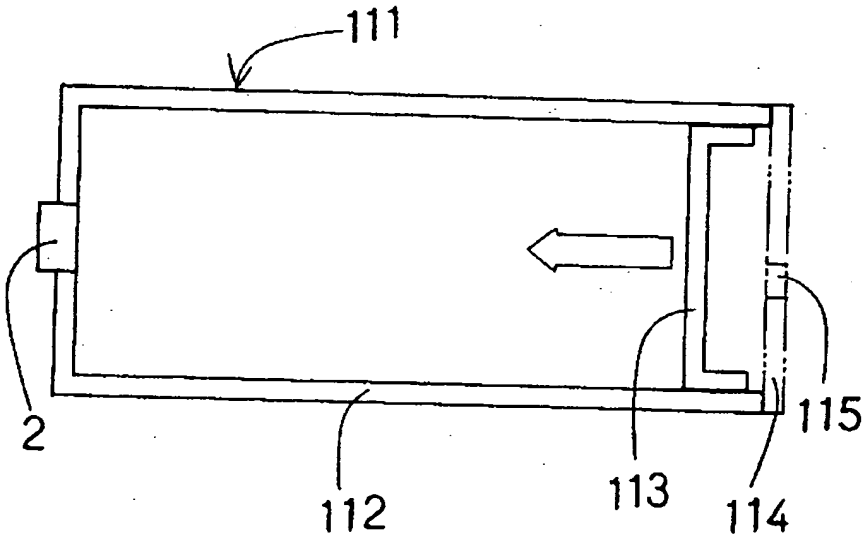

FIG. 5

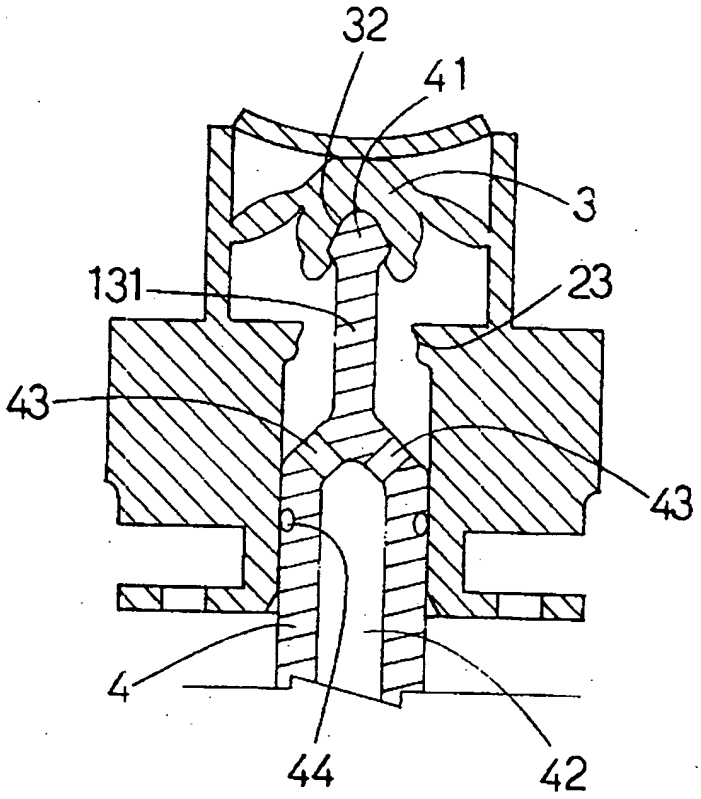

FIG. 6

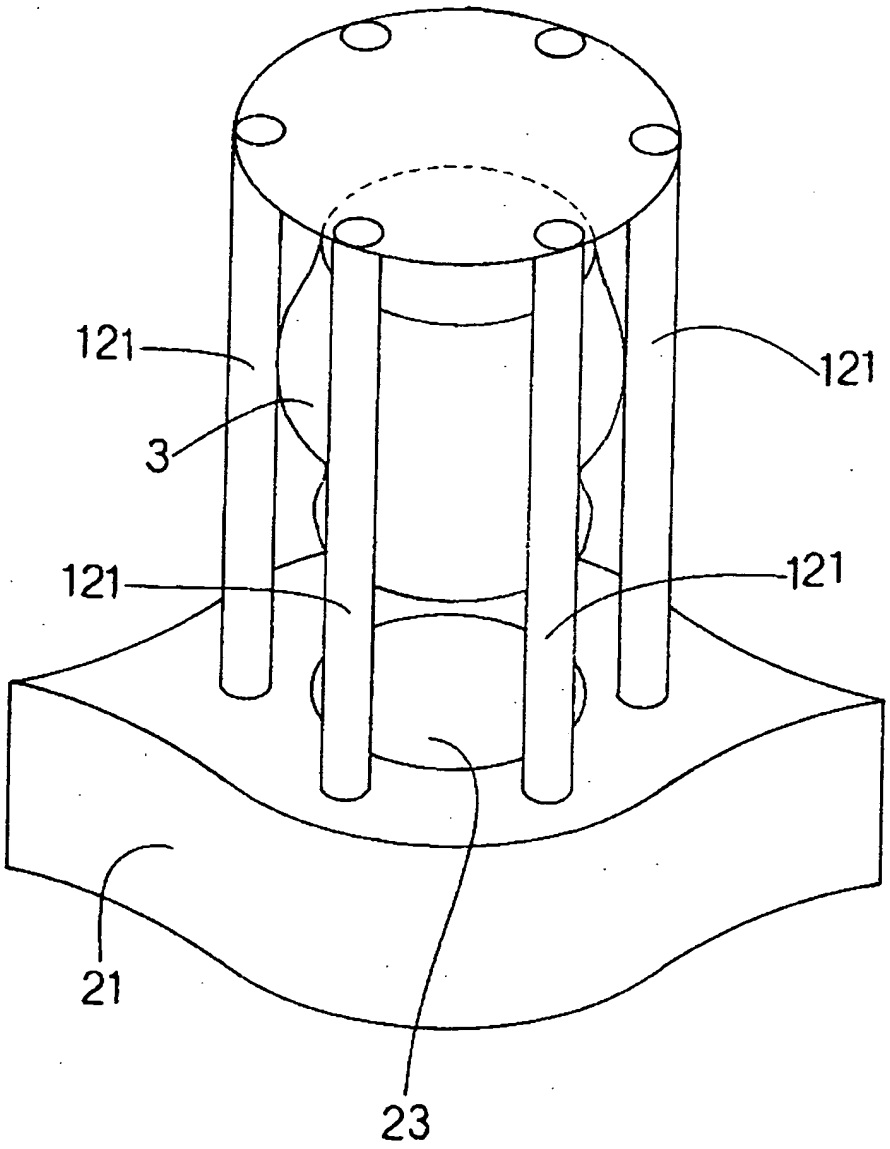

FIG. 7

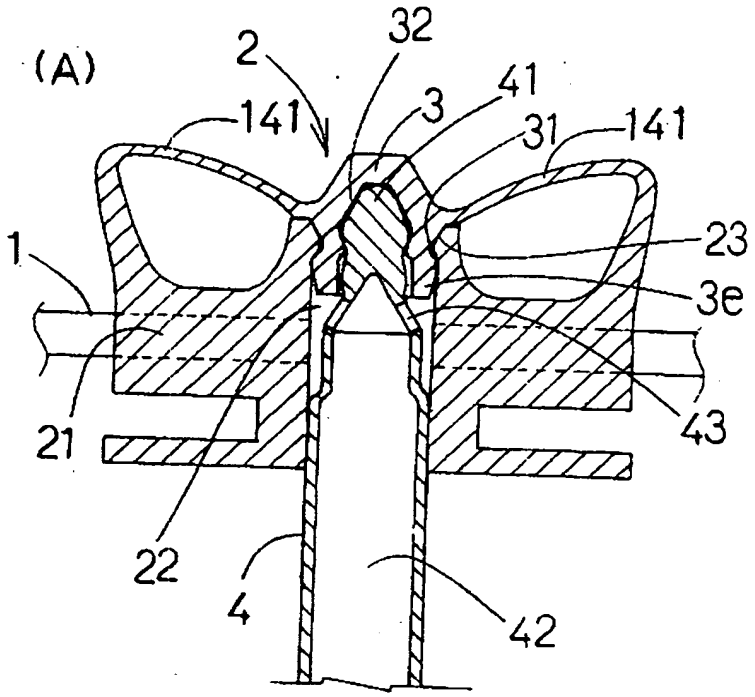
(A)
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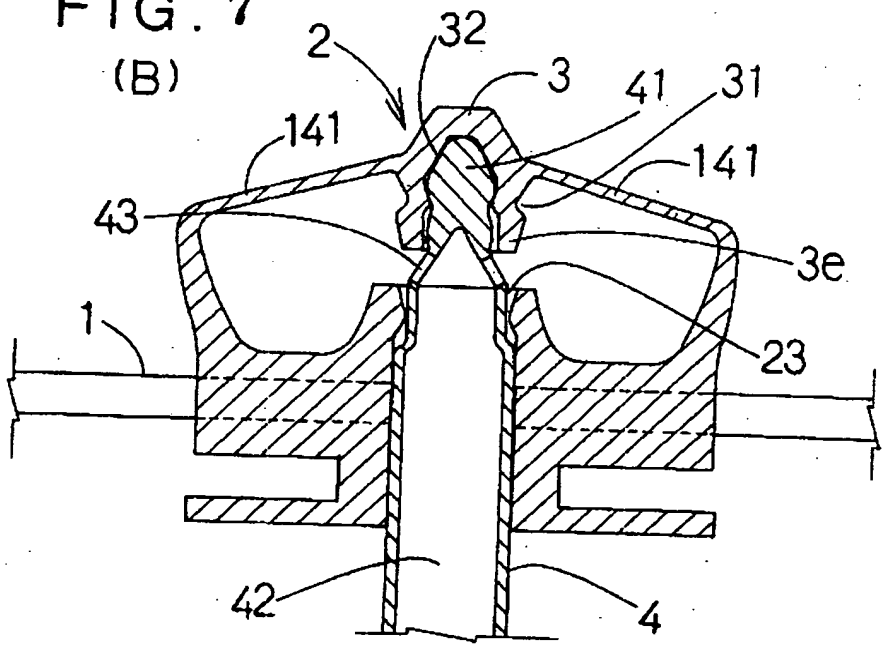
FIG. 7


(B)
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4

(A) FIG. 8

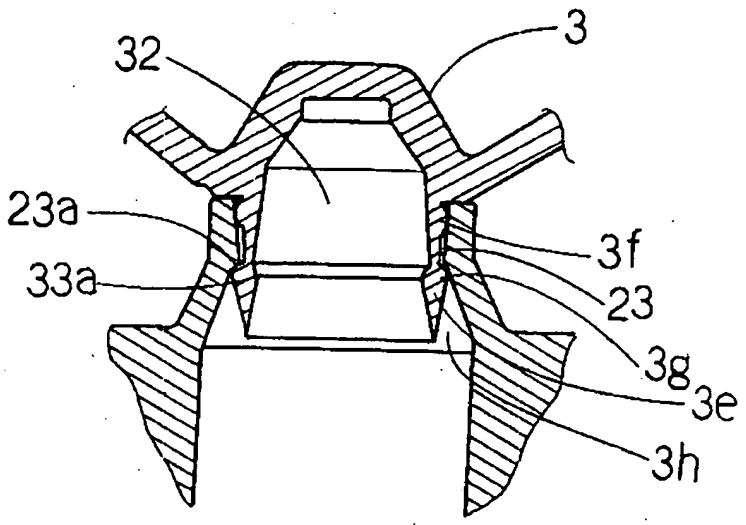

FIG. 8
(B)

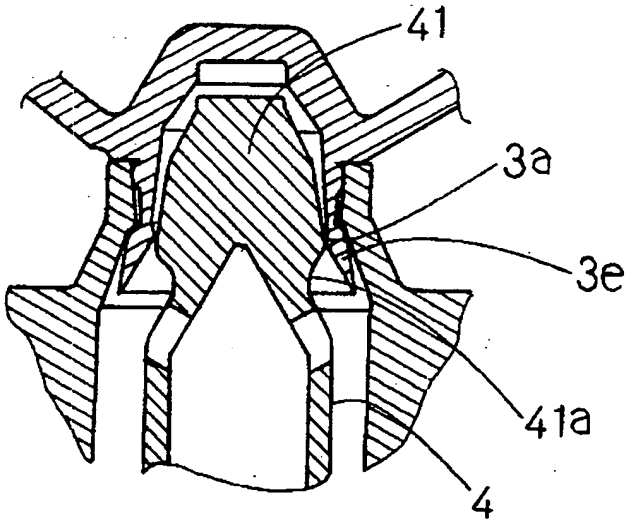

FIG. 9

(A)

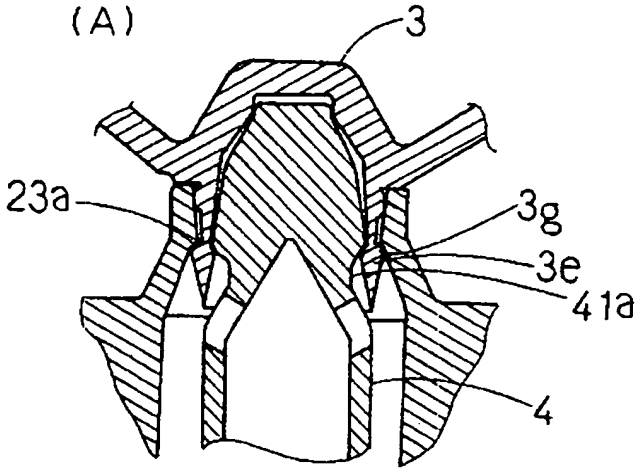

FIG. 9 (B)

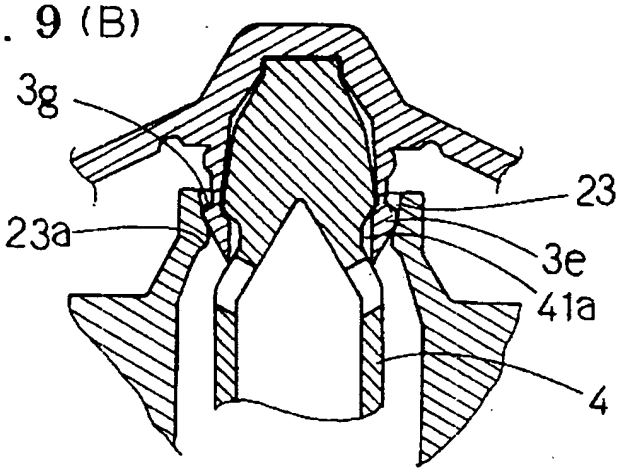

FIG. 9 (C)

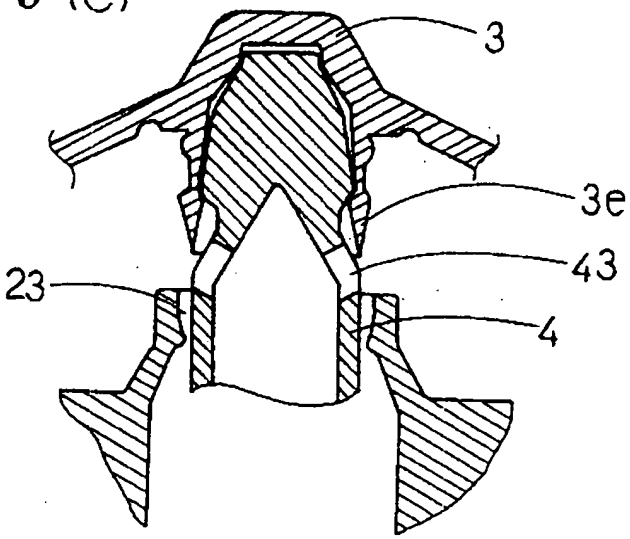

FIG. 10

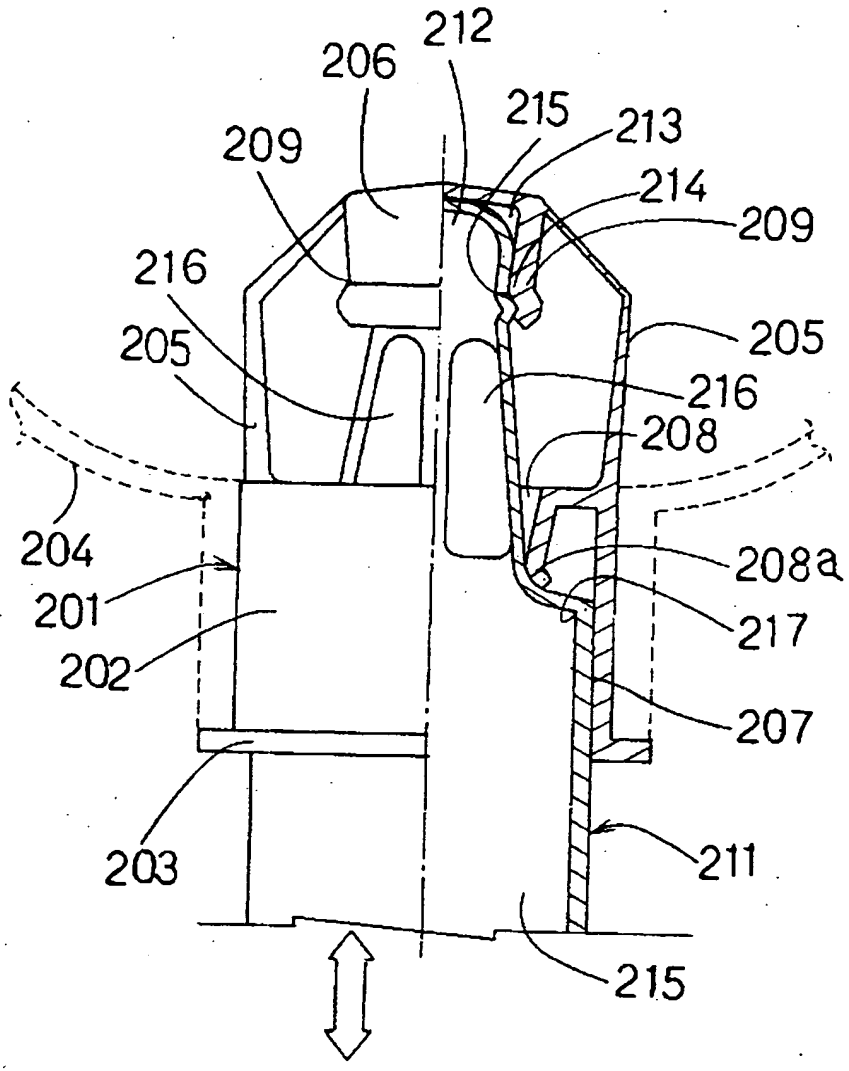
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FIG. 11

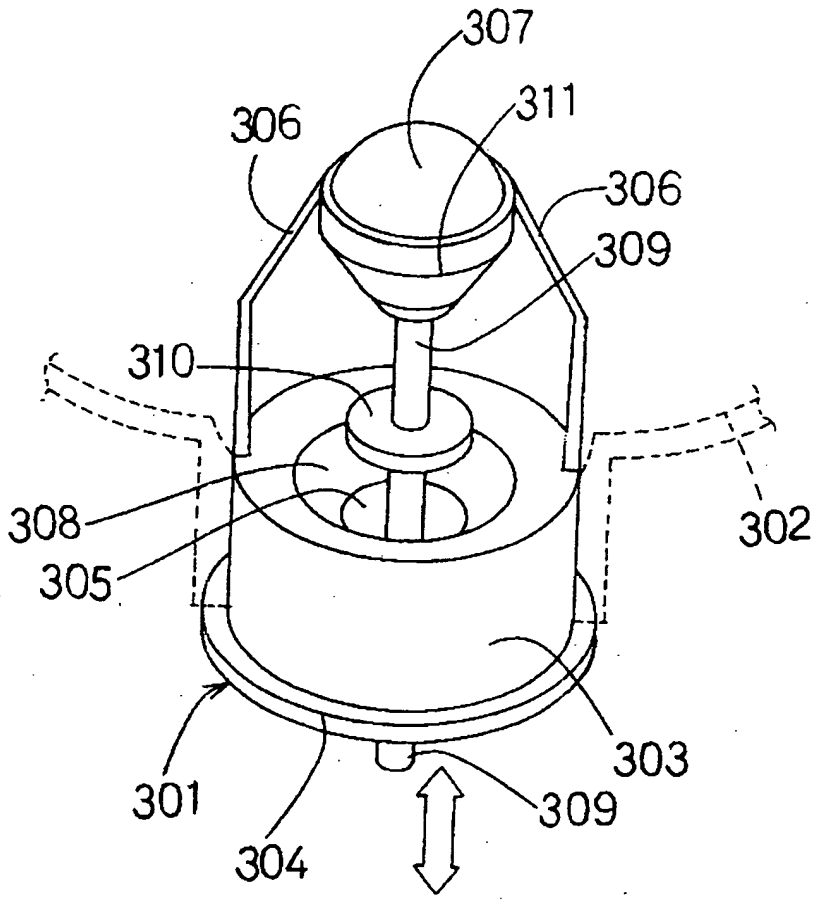

FIG. 12

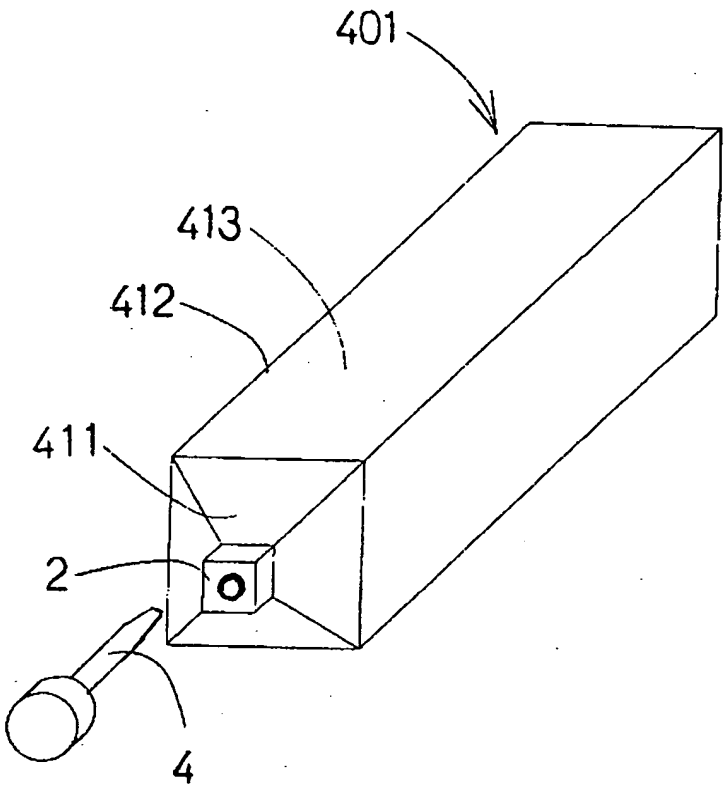

FIG. 13

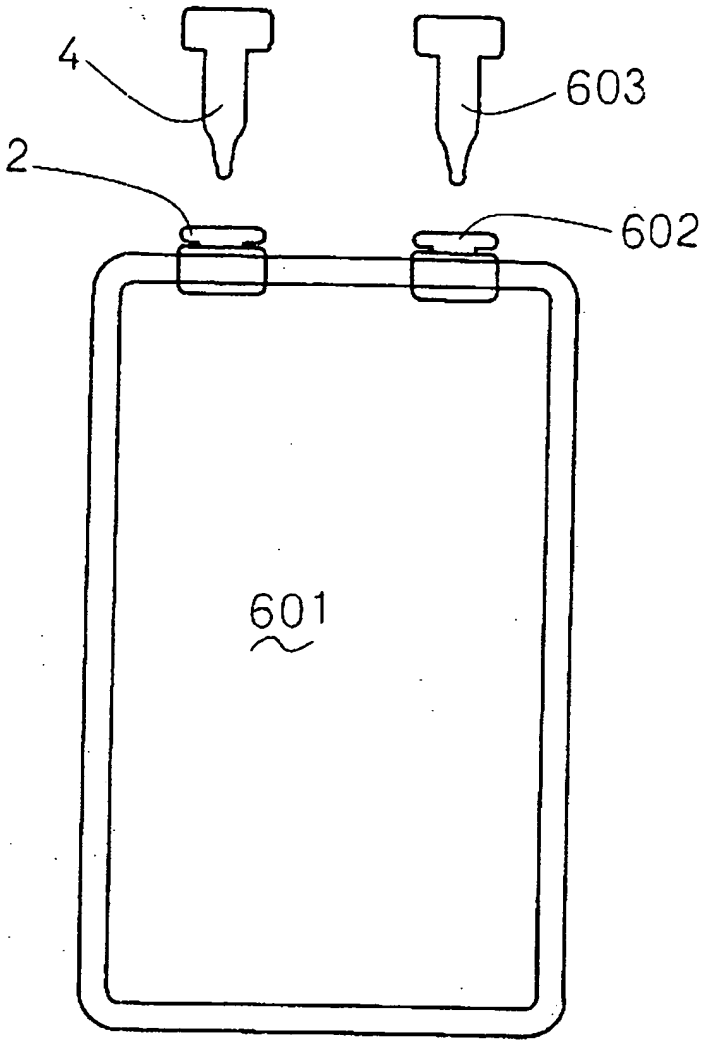

FIG. 14

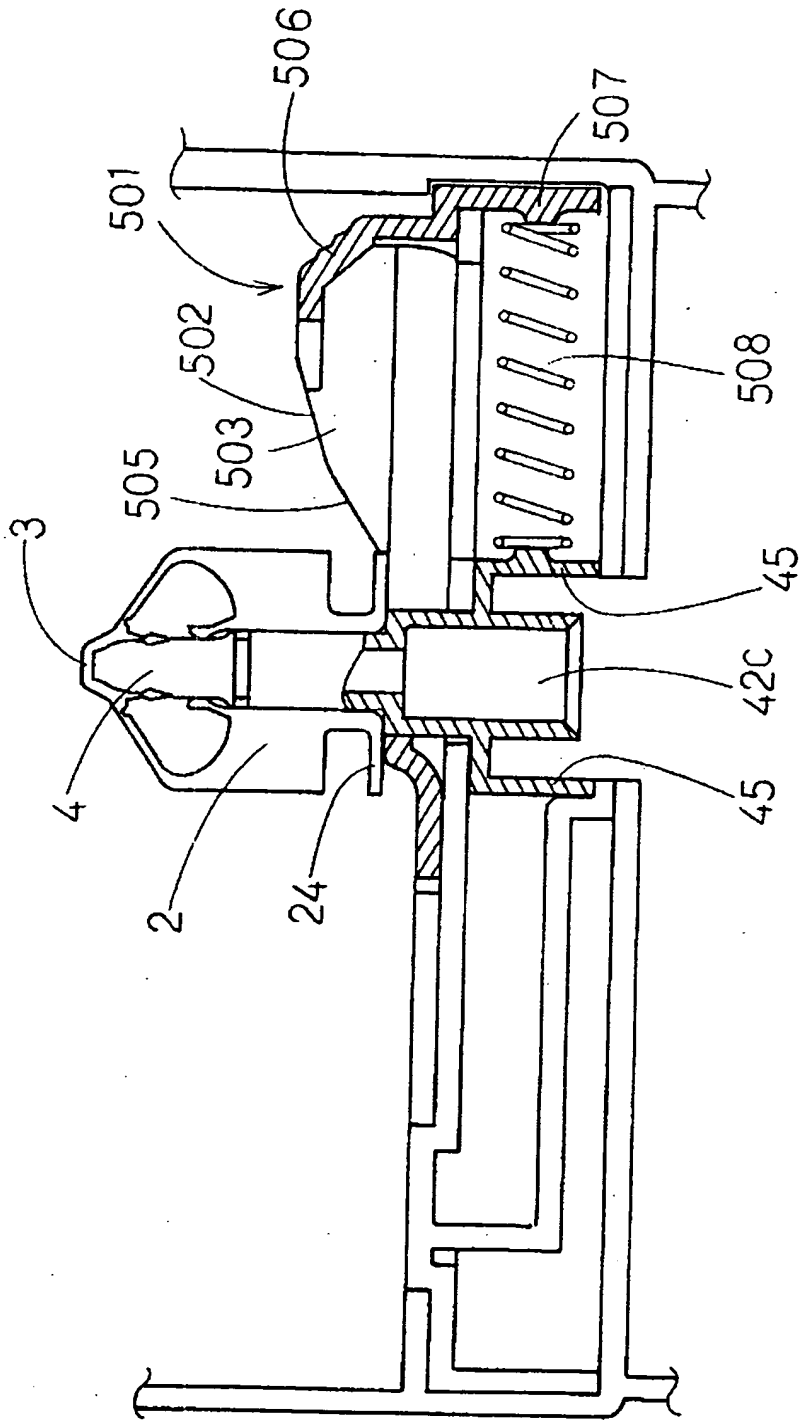

FIG. 15

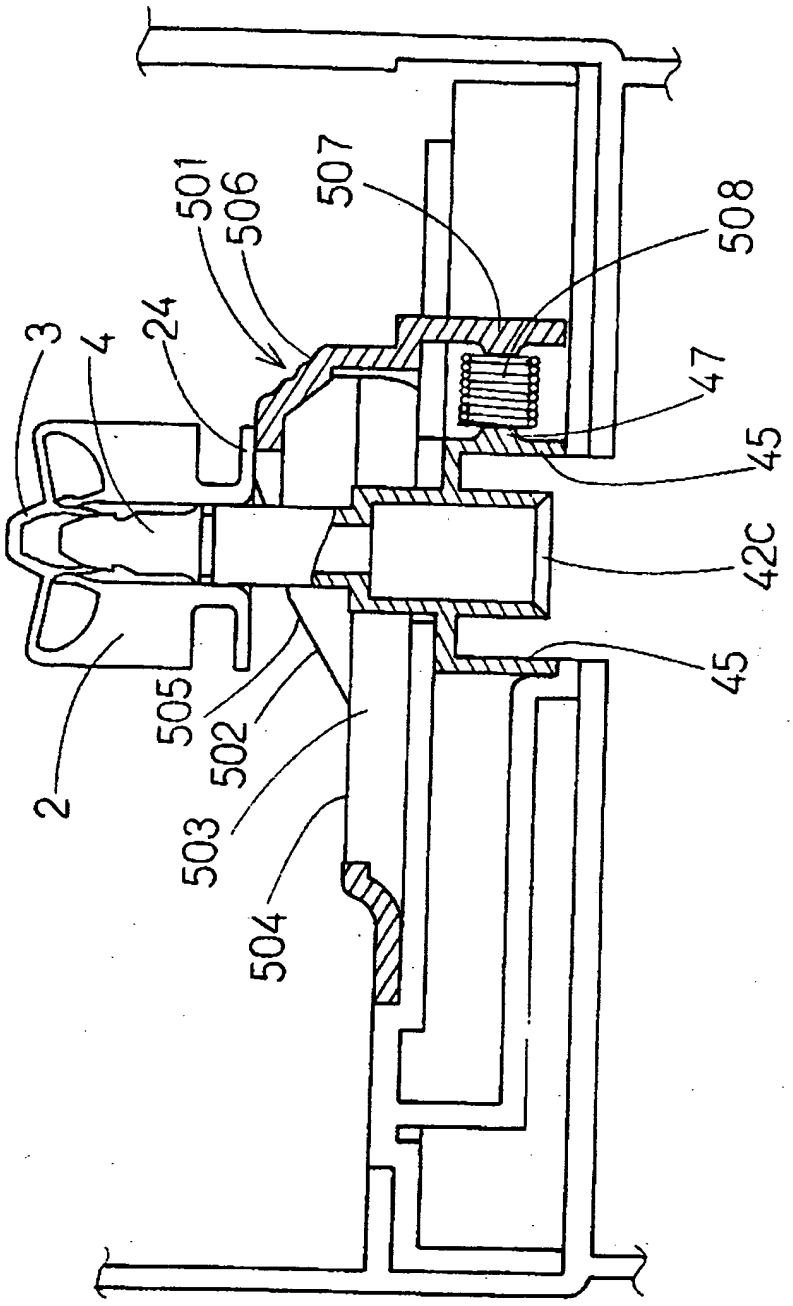

FIG. 16

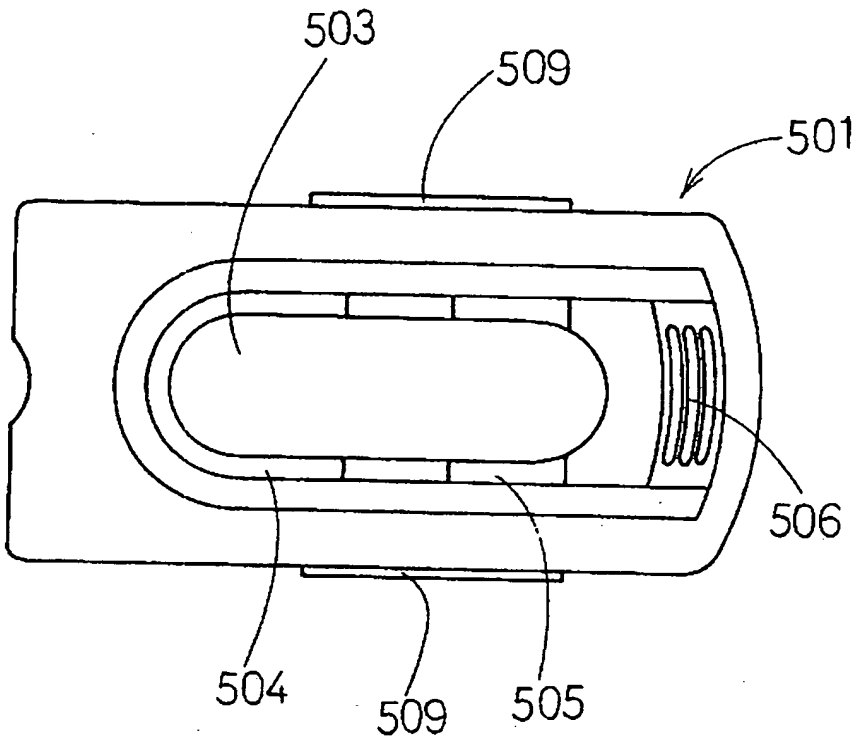

FIG. 18

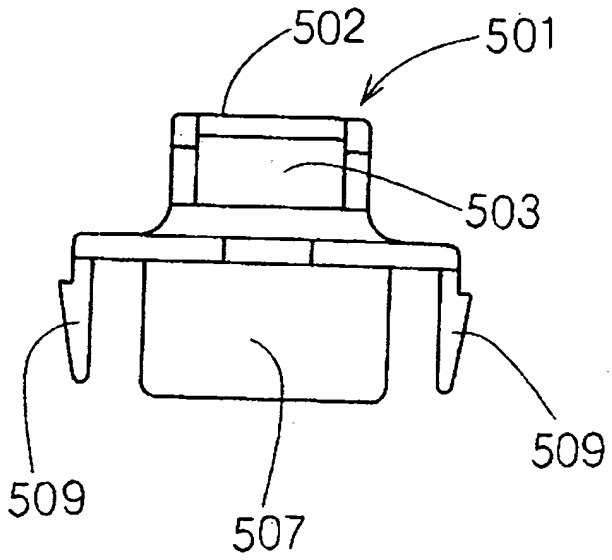

FIG. 19